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The Farmer's Digest

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The Farmer's Digest

Volume 5 April, 1942 Number 12

Finding Workers for America's Farms

Condensed from Marketing Activities

John J. Corson

Director, U. S. Employment Service

"HOW am I going to find enough help this year?" That question is undoubtedly plaguing more farm employers now than ever before in our history. The farmers who met their labor needs in former years by picking and choosing from a regular, annual flood of migrants will find it increasingly difficult this year to do their own recruiting. There aren't as many casual, aimless wanderers on the road as there used to be. And the shortage of rubber is likely to make further inroads into the numbers of workers whose jalopies carried them from place to place and crop to crop in a definite, planned yearly route.

But the problem of finding farm labor is not confined only to those who use seasonal workers. In some sections of the country, there have already been stringencies—even actual shortages—in the number of skilled farm hands who are employed on a monthly basis throughout the year. That has been particularly true of the dairy industry in certain States, to cite but one example.

In short, this is what the agricultural employer is up against in the year 1942 with America at war. On the one hand, he has been asked to raise his production goals. He has the job of growing the food we need for our fighting forces, for our civilian population, and beyond that —for our allies as well. On the other hand, producing food calls for workers — plenty of them and there just isn't as much labor available as the farmer has been accustomed to in former years. Many workers have gone into the Army and Navy. Others have found places in war industry.

The farm labor supply—like the industrial labor supply—is a national problem and can be

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solved only on a national basis. War production has made it too big a thing for individuals to handle for themselves. This year, more than ever before, farmers will find that their best bet for finding workers is the United States Employment Service with 1,500 full-time offices and more than 3,000 part-time offices scattered from coast to coast, from the Great Lakes to the Gulf of Mexico.

Until recently, the States operated these offices under the general supervision and co-ordination of the Social Security Board's United States Employment Service. To speed the mobilization of manpower for war production, the President ordered the Federal Government—through the United States Employment Service—to take over the State employment services. With centralized authority, it is believed that quicker action will be possible in mobilizing manpower.

Of particular interest to the farm employer is the fact that the farm placement service of the United States Employment Service has also been strengthened and streamlined. The head office of the Farm Placement Service is in Washington. The Nation is divided into regions, and twelve regional farm placement representatives work with the State farm placement supervisors in their regions. In turn, the State farm placement supervisors make sure that each local office of the United States Employment Service does its job in bringing employers and workers together. Finally—and this is where the work is actually done—each of the 1,500 full-time United States Employment Offices will have at least one man on its staff who will be responsible for farm placement activities.

That's the organizational picture. It doesn't mean, of course, that the farmer's labor problems are over. But, it does mean that the farmer can get help in finding workers — expert help from an organization that is equipped to carry out an intensive recruiting campaign.

Last fall, for example, the far-flung dragnet of the federally operated employment service in Arizona made certain that agricultural employers in that State got their crops in. Employers had told the service exactly how many workers were needed. From employment services in neighboring States, the Arizona service knew how many migrants would be likely to pull up stakes and when. The service knew also that workers coming into Arizona from neighboring States had to pass certain points such as plant-quarantine and port-of-entry stations. These stations were utilized in the job of directing migrants

to the areas where there was work to be done. When a migrant's car pulled up for inspection, the officer in charge gave the driver a map showing where each employment office in Arizona was located. If cotton pickers were needed in a particular area, the driver was directed to the employment office in that locality.

Signs dotted the highway telling the world that workers were needed and part-time employment offices were set up in strategic locations. The State police were called on for help in spreading the word that there were jobs to be had at particular points and that the employment office was the place to go.

What resulted was an orderly flow of workers to jobs and an orderly flow to other jobs as they opened up. Arizona's agricultural employers got the help they needed at the right time.

Connecticut faced a slightly different situation in that the supply of farm labor seemed to be exhausted. The magnet of higher wages in Bridgeport and other centers of industrial war production had drawn off many people who, in former years, would have been available for farm work. To meet this situation, the employment service went through its entire files of applicants, regardless of their previous occupation, and filled farm jobs from their ranks. Through the co-operation of the State Board of Education, recruiting was carried on in the junior high schools, high schools, and colleges. A campaign was directed to married and single women who had evinced an interest in farm work. Aliens, who were not eligible for certain types of work, proved to be another source of labor. Transients and "defense boomers" also filled in the gaps with the result that crops did not suffer from lack of workers.

In New York State, an intensive radio campaign was carried on by the employment service to recruit farm workers. Newspapers carried the employment service story, "Farm workers wanted. If you are physically capable of doing farm work, register immediately at the nearest public employment office. If you are looking for a job, consider it a patriotic duty to register immediately for harvest work." Through the State Board of Education students in rural schools obtained a "harvest holiday" to meet the crop emergency. Employment service campaign instructions and batches of registration blanks were sent to all teachers in rural and village schools. They, in turn, distributed the blanks to every student who was looking for work and to other people available for work in their localities. Then the employment service took over and

referred the applicants to the places where they were needed.

To cite one more example of the way in which total available labor supply can be mobilized in cases of extreme emergency, there was the experience of Oregon during the last hop, prune, and string bean harvest in the Willamette area. A bumper crop clamored for harvest at a time when the local labor supply appeared to be totally inadequate. Community co-operation, with the employment service playing an important role, was the answer. Schools delayed their opening, men on a 5-day week were urged by the Governor to go to the farms on their days off, stores closed down to permit their employees to add their strength to the argricultural army, and the employment offices directed the flow of manpower to the farms.

It is hoped that there will not be many such emergencies as that experienced in Oregon, but, if there are, the United States Employment Service will try to meet them through a systematic search for all the available labor in a particular locality, in nearby communities, throughout a particular State, and—because it is a Nation-wide organization—throughout the Nation, if necessary. "Food for-Freedom" would be a meaningless slogan, if manpower were lacking at the right place at the right time. The United States Employment Service can help the agricultural employer find needed manpower if it gets the co-operation needed to do the job—if the employer uses the service that costs him nothing. This is our message to the agricultural employer:

"Before your busy season—as far in advance as possible—get in touch with the nearest office of the United States Employment Service. If you do not know where to find it, ask at the post office.

"Tell the United States Employment Office exactly how many workers you need and when you can actually put them to work.

"Before your season ends, let the employment office know when you will be ready to let your help go, so that they can be placed somewhere else without loss of time."

This is the sensible, logical way to obtain needed farm labor if there is a shortage of workers in your locality. By full co-operation with the United States Employment Service, it can help you and you can help it solve the problem of labor shortages.

Feed Lot Equipment

Condensed from Capper's Farmer

B. F. Hobson

FEED-LOT labor has been reduced to a minimum through arrangement of facilities and use of equipment by John P. Kurt, Dubuque county, Iowa. Ten years were spent in developing the plant, making changes, which experience indicated would save time and labor, testing equipment, rearranging lots, constructing and remodeling buildings. Now one man can feed the cattle in three lots, each with a capacity of 120 head, in the time customarily required to harness and hitch up a team.

The whole chore process has been organized on an assembly line principle. Grain feed is prepared and mixed at one end of a carrier track, which extends more than 200 feet across all three lots. Silage is available in two silos, 14 by 45 and 16 by 45 feet, respectively, between the second and third lots. It is distributed also by the carriers, which can be spotted directly under the chutes and loaded as the silage is thrown down. Feed bunks over which the track extends form a runway for the attendant.

Grain-processing and mixing equipment were installed in the corncrib at the south end of the plant. A pit in the center of the drive provides quick unloading facilities and the elevator will deliver ear corn to the top of each bin from which it is chuted to either end. There is also shelled corn storage over the driveway. Provision is made for chuting either ear or shelled corn into the feed mill hopper. No shoveling is necessary except in emptying lower cribs. In that case corn is scooped into the pit and elevated to one of the upper bins.

Sometimes Mr. Kurt grinds ear corn, sometimes shelled corn and occasionally he mixes the two. From the mill the feed is spouted to overhead storage from which it can be drawn directly into the carrier for transport to the bunks. Shelled corn also can be spouted to the carrier, for pigs or for mixing with corn and meal to be fed the steers. A day's supply of corn is ground every morning at a cost of one-fourth cent a bushel for electric power. As an appetizer, Mr. Kurt likes to feed a little corn molasses, and prefers that it be mixed with corn and cob meal. Inasmuch as his equipment is not designed for this pur-

Reprinted by permission from Capper's Farmer, Topeka, Kansas, Sept., 1941

pose, a portable custom mill visits the place regularly to prepare this feed which is stored in a bin adjacent to the carrier station. About a pound a head daily is the allowance. Oil meal is available in a side bin, easily accessible to the carrier.

As a rule he fills the north lot, beyond the silos, in fall with yearlings and two-year-olds. These receive silage one feed and corn the other. Steers for the other lots may be purchased any time during the year. They are given a ration of corn and cob with oil meal and hay. Sometimes shelled corn is added. As they are sold, replacements are brought up from the corn and silage lot.

Each yard is supplied by separate hayracks, two from one barn and one from another. Hay can be thrown from the mow directly into the racks, which cuts the time for that operation to about fifteen minutes. Water level in two tanks, one of which serves two lots, is maintained by automatic floats. Cattle are bedded in sheds, in the lofts of which is stored baled straw.

Likewise, all lots are paved which is a decided advantage during wet or stormy weather. There is no necessity for moving bunks out of the loblolly that always forms in such weather, no mud balls collect on steers' tails, and no gains are lost from cattle slogging through belly-deep mire. Another advantage of the pavement is apparent when manure is to be cleared away. It is dragged into piles or windrows with a team and plank scraper to be loaded onto a rubber-tired manure spreader.

Thus, labor in caring for cattle has been reduced to a one-man job. Once the grinding is done, only about thirty minutes, twice a day, are required to distribute it. Mr. Kurt estimates the actual feeding, grain twice and hay once a day, requires not more than 1¼ hours for one man. Over the scoop and team method usually practiced, the equipment will pay considerable dividends in wages saved.

Modern Rain Makers

Condensed from Successful Farming

Carlton Stoddard

PORTABLE sprinkler irrigation is stealing the thunder of the rain makers. Man-made rain is no longer magic; it's the real thing.

Watch closely if you want to see spring showers falling with not a wisp of a cloud in the sky, revolving rainbows sparkling in the sun, water running uphill, corn yielding six times more than adjacent fields, crops unharmed by a layer of ice on their leaves.

"Rain whirlers" powered by your tractor, an electric motor, or stationary engine are undoubtedly one of the most effective remaining methods of increasing crop yields. Truck and fruit growers are already convinced of it, and field-crop farmers are close on their heels.

The value of artificial rain pumped through lightweight, portable sheet-steel tubing is an old story to potato and tomato men, but how about corn and alfalfa? "Will it pay in general farming?" I persisted in asking irrigation engineers and farmers from Oregon to Ohio.

They were way ahead of me. "It's already being done," I was told. And farmers themselves are way ahead of the engineers. Without waiting to be sold on the idea, they are clamoring for nozzles and couplings and centrifugal pumps, and paying the price without batting an eye.

It costs up to $3,000 to equip an average 160-acre farm so that you can water every acre of it, provided that you have access to a pond, stream, spring, or well that won't be sucked dry by a centrifugal pump throwing 500 gallons per minute. That rate of flow will cover an acre in one hour with one inch of water. An acre-inch of water weighs 127.5 tons, incidentally, if you are thinking the job might be done with a tank wagon. Two men and a tractor working 10-hour days can lay down an inch of rain on the whole 160 acres in less than two weeks. Nature turning on her faucet full force could do it in a half-hour, but it's your turn to smile when her sky reservoir runs dry and she is helpless to save your crop.

Well and good, but that $3,000 investment is too much for the average dirt farmer to swallow in one lump, I protested to the irrigation equipment makers. Their

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answer is the junior portable system, sponsored by F. W. Duffee, head of agricultural engineering at the University of Wisconsin. For less than $500 you can rig it up with two-inch and three-inch pipe and a three horsepower engine. It will assure you of a five- or ten-acre oasis, even if the rest of your land turns into a desert.

Don't wait for your crop to wilt, though, before you start sprinkling. It's like letting your house half burn down before calling the fire truck. The hot breath of a drought was already searing pastures in southeastern Iowa and Missouri last summer when I talked to Art Knoerzer, an irrigation engineer at Hammond, Indiana. Farmers were sending him frantic telegrams and letters wanting portable sprinklers installed overnight. Knoerzer shook his head. "It's too late now."

"If it's bad to wait until the leaves curl, how will I know when to start the sprinklers?" you are wondering. It requires judgment and sort of a sixth sense to space sprinklings between rains. Ordinarily it is best to apply nearly one to three inches of water and sprinkle less frequently. It takes less labor, which is a big factor. Moving the pipe sections by hand is work, even though they are light in weight.

Known as one of the smartest sugar beet growers in the Red River Valley, Merle Allen, of Sabin, Minnesota, shocked the natives by sprinkling right after a two-inch rain. His watering program for 150 acres called for just so much moisture reserve in the soil, so he kept right on sprinkling. He applies three to four inches at a time.

Sprinkling is drought insurance all right, even for the humid Cornbelt. W. H. Coles, an irrigation company engineer, reminded me that 20-year government records list 127 droughts ranging from 10 to 53 days each. Irrigation to supplement natural rainfall would have saved many a crop from utter loss—corn firing just at silking time, for instance. When you consider saving an entire crop, even a $3,000 system could easily justify its cost.

Like C. W. Ames, of Downs, Kansas, many farmers are setting aside a plot of ground and irrigating it as their "security patch" —assuring them at least enough vegetables to eat and feed to tide over breeding stock. Ames bought a centrifugal pump and an overhauled Buick motor in good shape, for $275. He is watering a 20-acre field; has gotten bumper yields of sorghum grain. Just outside the sprinkled zone, his sorghum produced no grain at all.

Since a centrifugal pump raising water by suction is limited to about a 15-foot lift, Ames dug a round pit 18 feet in diameter and

22 feet deep. He lowered the pump itself in this pit to bring it within easy reach of a five-foot layer of water-bearing sand. The pit is lined with concrete, like a pit silo.

Piped rain is producing results on Mid-west hay land equally as sensational. At Concordia, Kansas, Charles Blosser installed an electric centrifugal pump in an old sand pit along the Republican River. He ran the water to a 40-acre field of alfalfa through a six-inch main. It took patience—laying and relaying a four-inch lateral along the main. Assembling and disassembling, toting the pipe length by length. But he got *six* cuttings of superb hay, and the increased return due to irrigation was $22.80 per acre!

Let's look in on a champion potato grower, an old hand at the sprinkler game. Felix Zeloski of Antigo, Wisconsin, waters his 1,000-acre spud ranch day and night. Most everybody will tell you that evaporation in the hot sun is terrific—it's better to water in the cool of the evening. But Zeloski keeps right on making rainbows in the sunshine. His sprinkler line covers such a wide strip that it keeps the whole area cooled below the rapid evaporation point, A. H. Ames, another irrigation engineer, explained to me. The sprinkler droplets are large so that they will travel farther, and don't evaporate as readily as a mist.

Further evidence that water may be the best fertilizer of all is supplied by Wendell Baker, of Champaign County, Ohio. His sprinkler-irrigated corn yielded ninety bushels to the acre—*six times the yield of* nearby unirrigated corn. He doubled the yield of his sugar beets, cleared $2,500 for his pains.

The portable sprinklers can be used to ward off frost as well as insects. Water releases heat when it freezes. Four to six degrees below freezing may not injure the crop if the sprinklers are turned on.

Frank Rick & Sons, of Baroda, Michigan, sprinkled their strawberries all night. By morning the ice was an eighth of an inch thick on the leaves. But they kept on sprinkling till the sun melted the ice. The plants pulled through.

Selecting Breeders

Condensed from Turkey World

H. P. Griffin

THE turkey men of a decade ago were not thinking very strongly in terms of conformation. The far greater part of the breeding energy was devoted to producing some marvelously beautiful color pattern.

Then came a period when people began to look at turkeys with a speculating eye. The farm sideline that had been an interesting hobby had provided a few turkeys for the family on Thanksgiving and other special occasions, and produced a few birds for sale, began to have possibilities as a major source of income. With this new development, interest began to lag in feather birds. Market type strains began to show up all over the country. Market type became a term applied to all varieties.

The Broad Breasted Bronze was one of the popular market type turkeys that developed. There is no question but that the advent of this increasingly popular breed changed the entire picture so far as market turkey type is concerned. There is little use to argue that the Standard calls for a broad breasted bird. Everyone admits it. It is there in print. But no one, judge, fancier or producer ever saw fit to insist on birds being broad breasted, or even knew what a real broad breast was until this new breed set a fresh standard for market turkey excellence.

The development of the new type of turkeys created a need for a new technique in breeder selection based more on the standards for beef cattle and other meat animals than for fancy fowl. The Broad Breasted Bronze breeders developed a standard for selecting and judging breeders according to these new principles. Although this article is based on the principles of selecting and judging breeding stock, as set up by the standard of the Broad Breasted breeders' committee, the same principles apply to the selection of breeders *according to market type* for any other variety.

Selection of breeders as meat animals is far more simple than selecting breeders according to the A.P.A. Standard because of the fact that color is a negligible factor. A gray Bronze bird or any off-colored bird showing evidence of cross breeding can be thrown

out. Aside from that, color does not matter. Edging can be white or chocolate, backs can be bronzed or black, gray bars clear to the end of the main tail do not get a second glance, or a black wing feather matters little. From a strictly fancier's viewpoint, this is rank heresy, yet one wonders if that Montana woman wasn't about right when she wrote to a Standard Bronze breeder a number of years ago, "Even the coyotes don't eat the feathers."

The first point to take up in selecting a breeding animal is symmetry. By that is meant the correlation of the different parts, the balance of the bird. In order to judge this point, one must need to see the bird on the ground in its natural position. To provide such a condition at the exhibitions, most of the large, western turkey shows now provide the judge with a typing table or cage, a fenced platform with a dirt floor, large enough so that the bird can walk around freely.

The bird should be compact, close feathered, standing sturdily and with perfect balance on stout legs. Long, rangy birds mature too slowly; short stocky ones at times have trouble with fertility. Birds that tilt forward, have weak hocks, or an awkward gait should be discarded immediately. But don't look for the same type of walk on market type birds that you get with the narrow breasted type; these turkeys are like a good beef animal, they make two trails.

While the bird is still on the ground, look at the back and shoulders. They should be wide and flat; you cannot get a wide breast on a bird whose back slopes toward the sides like the roof on a house. Legs and feet are examined also while the bird is on the ground. These are heavy birds; they must have a good underpinning to stand up during the rigors of the breeding season. Particularly is this true of toms.

Picking up the bird for the body examination, take hold of the lower thigh, just above the hocks. It does not do these heavy birds any good to suspend them from the shanks for any length of time. They can take it if they have to, but why be harder on the birds than necessary? Hold the bird with your left hand and support its back with your left knee. The knee steadies the bird and enables you to hold all the birds at the same angle, leaving your right hand free to examine the bird.

Naturally, the breast is the most important single section of the bird. A good breast not only means more weight, but it is what sells the turkey. The breast should be wide, oblong, practically flat and parallel to the back. Heart-shaped breasts, wide in

front and tapering to the rear are undesirable, as is also the breast which lacks in depth toward the rear of the body. The fleshing should carry well forward over the wishbone, and there should be no tendency to a knob on the breast of the toms or a sharp point on the breast of the females. The rear point of the breast-bone should extend between the thighs as the bird hangs partially suspended. In a bird where your hand drops down to the abdomen, between the angle of the thighs and the rear of the keel bone, one of two things is wrong, either the bird is far too short in breast or else the legs are attached too far to the rear of the body.

The depth of body can also be judged while holding the bird in this partially suspended position. Passing your hand, held flat along the flesh covering the keel bone, the fingers should slide from the rear of the breast to the top of the thighs with no depression between. To word it a bit differently, the flesh covering the keel bone should be on the same plane as the extended thighs, or to make this point still more clear, the distance from the backbone to the breast should be the same as the distance from the backbone to front of the thighs on the suspended bird. If the breast extends out beyond the level of these extended thighs, it means the bird is too deep, with a tendency to be slab-sided and, in the case of a tom, not always a certain breeder. If the breast fails to meet the plane of the extended thighs, it is an indication of shallowness and general lack of constitution.

Turning the birds over, preferably on a table, one finds other points to examine. Look for a broad, strong, good feeding head, a strong but not too long neck, the wide, flat shoulders already spoken of and a continuation of this width right out to the tail head. Too many birds taper off sharply toward the rear end, a characteristic of birds having heart-shaped breasts.

The above constitute the essential points of breeder selection. Underlying the whole process is the fundamental fact that the birds must be uniform. No one is interested in raising simply a few specimens. The producer wants a flock of turkeys that will be uniform in size, in type and in conformation. He wants turkeys that after they are picked will pack right in the turkey boxes. In order to raise uniform turkeys, the breeding stock itself must be uniform, in both conformation and in blood lines.

A good breeder must be a student, not necessarily of books but of nature. First and foremost, he must know his turkeys. Unless he has the idea of correct type

firmly fixed in his own mind, how is he going to produce it? He must know how that type looks at every stage of its development, that he may take into consideration differences in weight, age and condition. There is no formula to follow that will make you a breeder, no short cuts, no by-pass. Measurements might help for the beginners, the uninitiated, but no livestock is ever judged or selected by measurement. In the great show rings of America, one sees no yardsticks, tape measures or scales. The richest prizes in the animal kingdom, exclusive of horse racing, are awarded by the decision of some one man who possesses the seeing eye.

That's what it takes to select breeding stock—observation. The ability to know type when you see it, the knowledge to balance strength against weakness and weakness against strength, the courage to discard, even when it hurts. One cannot measure masculinity or femininity on a breeding chart; both are essential to a potent breeding program. Nor can one define symmetry in all the word implies, that intangible perfection of parts that makes the perfect whole.

Protein Supplements for Hogs

Condensed from Duroc News

Both with hogs on alfalfa pasture and in dry lot, mixtures of protein supplements were more efficient than a single protein supplement in hog rations, it was found by C. M. Vestal in a series of experiments conducted at the Purdue Agricultural Experiment Station, LaFayette, Indiana.

In the dry lot experiment, a mixture of 20 parts meat and bone scraps, 20 parts menhaden fish meal, 30 parts soybean oil meal, 10 parts linseed oil meal, 10 parts cottonseed meal, and 10 parts alfalfa leaf meal proved especially effective. On pasture a similar mixture with the alfalfa leaf meal replaced by an additional 10 parts of soybean oil meal, gave best results of the supplements studied.

These mixed supplements were compared with a standard supplement of meat and bone scraps for purposes of the experiments.

Reprinted by permission from Duroc News

The Remount Service Breeding Plan

Condensed from The Horse

Major F. L. Hamilton

In Charge of Remount Breeding and Procurement in the States of Colorado, Arizona and New Mexico

THE Remount Service, a Division of the Army Quartermaster Corps, is an integral part of our National Defense Machinery. As such, the activities of the Remount Service can be justified only when they contribute directly or indirectly to the preparedness of the Nation. The Army Breeding Plan is a part of long range preparedness planning, looking to future as well as immediate security. These long range plans, in the case of the United States with its peculiar geography and uncertain fields of military operations, must be general and all-inclusive in the extreme. It is impossible to predict where, when, or under what circumstances the Nation might be compelled to fight. It is not enough for the people in the United States to follow the fashion of the present times resulting from a deliberate choice of time, place, and terrain by aggressor nations, and to prepare mechanically to the exclusion of all else. It is necessary also, in a small way, looking toward the innumerable possibilities of the future, to give some thought to horse preparedness.

That is the mission of the Remount Service and the purpose of its breeding plan. In the operation of this plan there is, of course, a limit to what can be done. Stallions can be supplied to civilian breeders; information can be disseminated; and some encouragement can be given breeders through limited purchase of military horses. Thereafter, one relies upon the cheerful, voluntary work of civilian associates to produce and to use good horses that might be made available to the defense forces in an emergency.

The Remount Service makes no pretense of dictating to any state or community the kind or type of horses to use or to produce. It is recognized that the military service must, to a large degree, adjust itself to the economic life of the nation at peace, and that the Army must in wartime adapt to military uses the livestock that farmers and ranchmen have pro-

Reprinted by permission from The Horse, Washington, D. C., Nov.-Dec., 1941

duced in the course of their normal peacetime endeavors.

Suitable military horses are to be found in practically all sections of the country and in use in a great variety of ways. Pleasure horses, hunters, race horses, polo horses, stock horses, light farm horses; all are readily absorbed by the military service, provided they possess in common those qualifications so essential to any *good* light horse: They must be good tempered horses and they must be durable.

Temperament is occasionally the result of breeding, but often it is a reflection of the temperament or the horsemanship of owners and handlers. Durability is the result of type and conformation, raising, and of training. If the type of the horse is such that it wears a saddle comfortably; if it is so shaped that it is naturally balanced and light on its feet with weight on its back; if it travels straight and freely at the walk, trot, and gallop; if it has been so raised that at maturity it is a horse of substance and strength; and if its respiratory and circulatory systems have been developed through intelligent work and use, it is almost certain to be a durable horse.

With the hope of improving these qualities, the Remount Service places mostly Thoroughbred Stallions with civilian agents. This is done with the firm conviction that the Thoroughbred is the proper foundation from which to develop light horses for any particular or general purpose. The past proves it so. Practically all the light horse breeds, worthy of a name, have their tap roots in Thoroughbred ancestry. *Messenger,* a Thoroughbred, was the foundation sire of Standard or trotting bred horses. *Denmark,* a Thoroughbred, fathered the famous American Saddle Horse. *Steeldust,* all controversy aside, was probably a Thoroughbred or nearly so. The same may be said of *Justin Morgan.*

These facts, together with the great improvement in the horses of this country during the past twenty years, resulting from the use of Remount Stallions, furnish ample physical evidence that the Army's breeding plan is sound.

There is an awareness at this time, however, of an unsatisfactory trend. It now becomes apparent that *in some sections* there is a limit to the number of Thoroughbred crosses that can profitably be put on native mares. Originally, the Thoroughbred springs from small, slight, desert-bred horses that in their natural habitat are little more than ponies. Through generations of forced feeding and care, almost to the point of pampering, the Thoroughbred has come to have con-

siderable size. Deprived of this feed and care and left to make his own rough way the breed is likely to revert to type and become small and weedy.

To derive the maximum benefit from these stallions; to develop a line of horses suitable to local needs; to produce horses that will find a reasonable market; and to help in placing a military reserve of suitable horses in the country—individual breeders should look farther than the stallions. The mere pouring of blood in at the top will not insure the production of good horses. Selection of brood stock, proper matings, and a long period of adaptation, blending, and absorption is necessary if anything worthwhile is to be produced.

Strangely enough, the improvement resulting from breeding to Thoroughbred stallions is most obvious and most encouraging in the first cross. Bred to a big, straight, roomy mare, the resulting Half-Bred generally shows an unbelievable improvement. From there on, the number of crosses that can be made with profit and pleasure will depend almost entirely on the amount of intelligent care and feed that can be given to the growing colts; especially during their first two winters.

It is the hope of the Remount Service that those who take pride in the ownership of nice horses, and who have the experience and facilities necessary to produce them, will make full use of Government stallions, to the end that the light horses of the country may become military assets available to the armed forces in an emergency.

Electric Eye Sorts Cotton

Condensed from Southern Agriculturist

Kenneth B. Roy

Agricultural Editor, University of Arkansas College of Agriculture

THE photoelectric cell, which has made many a difficult job easy, now has a new assignment—sorting cotton.

The photoelectric cell, which the ingenuity of man has put to work counting automobiles to measure traffic on highways and bridges, measuring the correct exposure of photographic film, controlling the beacons that light the nation's airways, and doing a multitude of other jobs, is simply a small piece of metal coated with a silver-colored chemical which, when exposed to light, converts the light into electric current. The fact that the cell is so sensitive to light that it may be made to measure the slightest variation, prompted its use in the sorting of cotton fiber at the laboratories of the University of Arkansas College of Agriculture.

In a cotton breeding program, the measurement of the lengths of fibers of a vast number of varieties under test and experimentation is extremely important. The combing and sorting by hand method is such a labor- and time-consuming job that it makes it practically impossible to handle a large volume of seed samples such as clears the cotton laboratories of the Arkansas institution. For example, by the old hand method it takes an experienced person one-half day to comb and sort an eight-seed sample. When one realizes that some 20,000 samples from the breeding and test plots on the college's experiment stations go to the laboratories for analyses during the fall and winter months, the need for speeding up the process becomes apparent.

Two machines were designed and built in 1937 in the laboratories of the college, in order that much larger, more representative groups of analyses might be made. Both machines have been used successfully in the investigations there the last two years.

The first machine developed is the mechanical comber. This eliminates the human element to a large extent, gives all seed the same treatment, and may be operated by an untrained person. In hand combing only one seed is combed at a time, while in the

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mechanical comber ten seeds can be combed in one minute. Furthermore, hand combing requires a trained person who has learned to hold the fibers on the seed and to judge the amount of combing required, whereas, with the mechanical comber, all seed are treated alike. The seed combed on this machine by an inexperienced operator are as well combed as those combed by an experienced person.

Some 20,000 ten-seed samples from the college's experimental plots were combed on this machine last fall and winter. Imagine combing 200,000 individual seeds by the old hand method!

After the measurement of lint length, eight of the ten seeds are selected and transferred to the sorter frames, and are then ready to be placed in the multiple sorter, the second machine developed by the laboratory. It utilizes eight photoelectric cells. The basis upon which the sorter operates is the amount of light passing through the lint samples to the photo cells and recorded by the ammeter, readings of which are noted on a standardized form sheet.

The development of these two machines means making possible the fiber measurement of all samples taken from the experimental plots. Taking a tip from industry's plan of line production, five untrained persons, each doing a particular job in the process of measuring, can comb, measure, sort and calculate 120 to 130 eight-seed samples a day. By the old hand-sorter method, it would require sixty persons, trained and skilled in combing, pulling and measuring, to accomplish the same amount of work. Floor space, limited number of hand sorters, costs, and lack of skilled operators made such a staff an impossibility. Thus the breeder had to be content with the fiber measurements of relatively small, representative samples from his test and breeding plots.

To the cotton farmer, the development of this equipment means speeding up the state's cotton breeding program. All samples may now be measured and treated comparably. The chance of human error has been greatly reduced. Conclusions may be drawn safely and more rapidly. Strains and varieties lacking certain desirable fiber characteristics may be discarded without reservation, and efforts may be centered upon varieties of preferred staple length which show real promise for production under Arkansas growing conditions.

R. O. P. and the Progeny Test

Condensed from Everybodys Poultry Magazine

W. C. Goodson

THERE is no rabbit to pull out of the poultry hat. No hocus pokus, no open sesame. There is plenty of good hard work, and with this the basis of management, there are good profits. Good chicks, good feed and feeding practices, and good management are well known terms. We have heard about these three things so long it is a wonder more of us don't try them.

Good chicks mean good breeding and good breeding means a lot of painstaking work. One aspect of good breeding is a good Record of Performance program. Notice I have said a good R.O.P. program. Right here I want to say again something I have said many times before. R.O.P. is not a breeding program. It was never intended to be a breeding program. Record of performance work is a sharp edged tool that will help poultrymen if used properly. R.O.P. is no cureall, however.

In outline, here is what R.O.P. means. In order for a hen to qualify for R.O.P., she must (1) lay 200 eggs in 365 days, (2) the eggs must average two ounces each, (3) the bird must be of proper type and body weight for the breed, (4) the bird must be free from standard disqualifications, (5) the flock must be free from pullorum, and (6) the records must be made in trap nests and some disinterested official must regularly inspect the flocks and verify the records.

It is an unpleasant truth, and any breeder will tell you so, that every bird laying 200 eggs is not necessarily a good breeder because of this fact. Every year we send hundreds of 200 eggers to the slaughter house because they are not good breeders. How do we know they are not good breeders? We know because we carry on a progeny test program. This is what is meant by a good R.O.P. program.

A breeder can breed R.O.P. birds by the thousands and not run any sort of a progeny test program. R.O.P. does not specifically call for any progeny test work, but good breeders know the value of the progeny test, and they use it. When R.O.P. work is carried on in conjunction with a complete progeny test

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program, you can be sure that the resulting chicks have something behind them. This something is the thing that puts the dollar sign in front of our billion dollar industry, and the figures 1,000,000,000 mean little without the little $ in front.

Let's examine the R.O.P. requirements. (1) 200 eggs in one year. This is an attempt to establish production and is obviously important. (2) two-ounce eggs. Here is an attempt to place importance on egg size. This, too, is important, for it costs no more to produce a dozen large eggs, and yet the dollar value is much greater. (3) Proper type and body weight and (4) freedom from disqualifications may be considered together, for both are factors that lead to an ideal bird. (5) Freedom from pullorum is, of course, very important and is an effort to attack the disease problem. (6) Records made under impartial supervision show the willingness of the breeder to co-operate with an official agency and also his willingness to have his records open to inspection.

So far as the above points go, so good, but we must go beyond these points if we are to call ourselves breeders. After we have located the R.O.P. hen, we must find out what kind of a breeder she is. A bird that lays 200 eggs, or 250 eggs, or 300 eggs is worth nothing from a breeding standpoint unless she can transmit to her offspring the ability to duplicate her achievements.

R.O.P. has come in for a good bit of abuse at the hands of some really fine breeders. Many things these men have said are true. R.O.P. has limitations; it does sometimes hinder a real breeder because of its requirements; and it is used by some as an advertising stunt. But we can attack anything we wish and find things wrong with it. What the most vehement critics of R.O.P. have not been fair about is the fact that R.O.P. sets minimum requirements. R.O.P. has never said how far a breeder may go. This is up to the man himself. If he is conscientious and wants to do a thorough job, the sky is the limit. If he wants to use R.O.P. as an advertising stunt, he can do too, but in the final analysis, the chicks will show him up. In one case the breeder uses R.O.P. as a tool to build a solid foundation—in the other, he uses it as a tool to jimmy the lock.

Progeny Records Tell the Story

R.O.P. says nothing about hatchability, livability, feathering, broodiness, winter pause, intensity, persistency, or early maturity. You and I know these things are important, and so does the breeder. The way to find out about them and improve on them is to run a progeny test. When this is done, there is no guess-

work. We know by actual records what a given bird is worth.

There are several ways of running a progeny test. In my opinion, there is one best method. This method is expensive and possibly, because of the expense, impractical for some breeders. But we have already spent quite a little if we are trapping and keeping records. A little more is only adding a small amount to our investment and is an added assurance of success.

Keep Record on Entire Family

When we set out to select pullets for the progeny test, we first decide which families we wish to use. Once this is determined, we run the test on the entire family. By entire family I mean just that. We trap the poor birds along with the good birds, and at the end of the year, we select breeders on the basis of family average. Selection is made on a basis of many things, many of which do not enter into an R.O.P. program.

Such a progeny test system is, I think, the most accurate means of appraising a family. I should a thousand times rather have a family of ten daughters averaging 180 to 210 eggs with all birds laying somewhere near the same number of eggs than to have a family of ten daughters averaging 180 to 210 eggs with some birds laying 250 to 300 eggs and others laying only 140 to 150 eggs.

Unless we test entire families, we don't know all the facts. In the first case, a complete progeny test, we would probably retain all the daughters since production would be fairly high. In the secon case, using a partial progeny test, we would cull the daughters showing poor production and what would the result be? Why we would automatically raise the average production on those daughters remaining and we would think we had something exceptional. So far as available figures are concerned, the second group would be better breeders, but so far as individuals are concerned, the first group would be way ahead of the second.

It is an old story. You can make figures do what you want them to, but you can't make birds do what you want them to. Science and genetics do this for you, not a sharp pencil. All poultry breeders are looking for the perfect bird. I don't believe anyone has ever found it. I don't believe anyone ever will.

Production Isn't Everything

We have talked mostly about production in appraising a bird. I suppose the reason is that people want to know how many eggs a bird will lay. But production isn't all by a long shot. There are other things of equal importance and each one gives the breeder more information. The more information, the better the flock,

and the more information, the more headaches. Nothing worthwhile is easy.

Today more than ever, the average poultryman must have better chicks. Chick prices are higher, feed is higher, labor is higher. To combat these increased costs, the poultryman must have stock that will produce more eggs, live better, and hatch better. R.O.P. may not be the answer, the progeny test may not be the answer, but surely a breeding program using the two has a great deal of merit.

Dairy Cattle Feeding

Condensed from The Jersey Bulletin

W. B. Nevens
University of Illinois

ALL dairy cattle except very young calves should have free access to salt. When this is not possible, salt may be included in the grain mixture at the rate of 1.5 to 2 pounds in 100 pounds of the mixture.

Good quality legume pasture, legume silage, or legume hay, and skimmilk are the best sources of lime for dairy cattle. When legume roughages cannot be supplied, lime may be furnished in ground limestone or in bonemeal of feeding grade. These may be included in the grain mixture at the rate of 1 to 2 pounds for each 100 pounds of mixture; or, for cattle fed in drylot or at pasture, a mixture of 2 parts limestone, 2 parts bonemeal, and 1 part salt may be supplied in boxes to which the cattle have free access.

Grain mixtures properly balanced with protein supplements such as wheat bran, cottonseed meal, and soybean oilmeal usually prevent phosphorus deficiencies. But in a ration that is largely roughage, that contains but small amounts of high protein supplements, or in a ration the feeds of which are grown on soils low in phosphorus, some additional phosphorus may need to be supplied. When extra amounts of phosphorus are needed, bonemeal is a good source. Rock phosphate should not be used for this purpose.

Additional amounts of iodin for the prevention of goiter are rarely needed by dairy cattle in some states, but if needed, are

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best supplied as iodized salt fed in place of ordinary salt during the last three months of pregnancy.

Dairy cows well supplied with good pastures throughout the growing season and with good quality sun cured roughages throughout the barn feeding part of the year are not likely to suffer from vitamin deficiencies. Next to green growing crops, legume hays that have been so carefully cured in the sun that they retain most of their leaves and much of their original green color and fragrance are the best sources of vitamins for dairy cows.

Calves fed only skimmilk, grain mixture, and hay low in green color are likely to need extra amounts of vitamin A. Also calves may need a vitamin D supplement during the winter months or during the remainder of the year also unless they are out in the sunshine for an hour or more daily. If the calves consume 2.5 pounds or more of good quality sun cured hay per head daily they will receive plenty of vitamin D. A feeding grade of cod liver oil given at the rate of 1 level teaspoonful daily per 100 pounds live weight usually provides ample amounts of both vitamins A and D.

Several different processes for "fermenting" or "converting" feeds have been placed on the market during recent years. The general plan is to add substances such as yeast, or malt, together with hot water, to either whole or ground roughages, depending upon the process used. Heat is sometimes applied to hasten the fermentation or conversion process.

Aside from the fact that coarse feeds are somewhat more completely consumed when treated in these ways, such processes have little to commend them, for they involve amounts of labor and expenditure for equipment and materials seldom warranted by the results obtained.

Carefully conducted investigations have shown that the protein of simple mixtures when fed with good quality roughages give just as good results as mixtures containing a much greater variety of feeds. A general guide to follow in determining the adequacy of the proteins is that a ration is satisfactory when it contains feeds from four different kinds of plants, provided each plant comprises a reasonable portion of the ration.

When, however, cows are receiving 15 or more pounds of grain mixture daily, there is special advantage in using grain mixtures that contain a number of different feeds, the advantage being that the appetites of the cows are better maintained.

The grinding of farm grains to be fed to dairy cows usually increases the feeding value by 15

to 20 per cent. For high producing cows and very small calves the grain should be ground. For low producing cows, older calves and heifers, the cost of grinding the grain should be compared with the increased value brought about by grinding. Protein supplements also should be purchased ground rather than in nut or pea sizes, since the ground supplements mix better with ground grains.

There appears to be no advantage in grinding good quality hay for dairy cattle, because the digestibility of the hay is not increased thereby. Grinding or chopping coarse roughages such as soybean hay and corn stover reduces the amount of refused feed as compared with the same roughage given whole, but the coarsest portions of such feeds are so low in nutritive value that the real saving may amount to not more than 5 to 8 per cent of the feeding value.

Another disadvantage to grinding roughage is that the dust from ground roughage is objectionable. For one reason, it is likely to get into the milk; and for another, it may irritate the throats of the workmen. The dust is particularly objectionable in barns where high-grade milk is produced.

Feeding dairy cows a mixture of grain and roughage that have been ground together is not good practice, because it makes it impossible to feed the grain in proportion to milk yields and at the same time give the cows the amounts of roughage they need.

When rations are very deficient in calcium, abortion sometimes occurs; but such cases are rare.

Improved feeding of dairy cows does not, as a rule, raise the percentage of fat in the milk. Better feeding increases the yield of milk and consequently the yield of fat, but it does not increase the test.

A cow's test ordinarily varies somewhat during the lactation period. Cows that are fat when they freshen give milk that tests considerably higher than usual for a few weeks; after that the test tends to remain about constant for several months, although it may fluctuate slightly from day to day or from week to week as the result of weather changes or other factors. Toward the end of the lactation there is a gradual increase in the test and during the last two or three weeks a sharp rise usually occurs. The test usually is slightly higher during cold weather than during hot weather.

When market requirements demand that the test of the milk of a dairy herd which is receiving good feed and care be higher than it is, the way to improve the test is through selection and breeding rather than through

changes in feeding practices. The culling of low testing cows and the selection of daughters of higher testing cows for herd replacements is the way to improve the herd test.

Though silage is a desirable and economical feed, high milk yields can nevertheless be obtained without silage or roots, provided high quality legume hay is fed liberally.

In order to produce milk of the highest quality, cows must receive liberal amounts of good quality feeds. Best results are obtained when cows are kept in good condition throughout the year.

Though the amounts of most of the minerals in milk cannot be changed appreciably by changing the amounts of minerals in the feed, it is essential that the minerals be adequately supplied in the feed in order to maintain a high level of production. Most of the minerals in the ration are furnished by the roughages — pasture, hay, and silage. Legume forages are the best source of calcium. Most of the roughages, however, are not good sources of phosphorus, which is best supplied in high protein supplements. As a rule, roughages grown on fertile soils are much higher in mineral content than roughages grown on poorer soils.

The vitamins naturally present in milk also are obtained mostly from the roughages. High vitamin content of milk is maintained by feeding cows on fresh green pastures that continue their growth throughout a large part of the year, or by feeding them silage (including grass and legume silage) having a good green color, and excellent quality legume hays that have been quickly cured.

Flavor in milk is definitely affected by feeds. Rations containing ample amounts of protein, minerals and vitamins, and which have as their basis large amounts of green pasture crops or well cured roughages high in carotene (green color), usually result in good flavored milk.

Some feeds, however, and many weeds, have a detrimental effect on flavor. Wild onions, wild garlic, and ragweeds have such pronounced effects that the milk may be unsalable. Green rye, corn or legume silage, potatoes, buckwheat, rape pasture, cabbage and sweet clover also tend to give undesirable flavor to milk, particularly if the cows have access to them within 6 to 8 hours before milking. If any of these feeds are used, they should be given to the cows just after milking rather than just before.

How Much Rent Can a Cow Pay?

Condensed from Agricultural Engineering

M. Glen Kirkpatrick

Associate Member A.S.A.E.

THE title of this paper suggests a corollary of a more general proposition, namely, whether farm buildings should be built on the basis of what animals can afford, or on the basis of what their owners would like to have.

The conception of the function of farm buildings has changed somewhat in the past fifty years, and that affects somewhat the approach to the subject of economy of farm buildings. For instance, I find in a copy of "Farm Journal" published in 1888, plans for a barn designed by Professor I. P. Roberts, who was head of the agricultural college at Cornell University. An article accompanying these plans stated that the barn was patterned pretty much after a building in use at Cornell University.

The barn was 28 x 36 ft. Posts were 25 feet to the eaves. The peak of the roof was 45 ft. from the ground. There were two stories and a haymow in the building. Hay chutes from mow to first and second floors were built outside the building. The first floor had stalls for cattle across half the building and a manure pit across the other half. Directly above the manure pit were stalls for horses, with openings through which horse manure could be cleaned into the manure pit below so that the combination of horse and cow manure could be worked over and mixed together by the dairy cattle. Floors of horse stalls were made watertight with asphalt.

Directly above the first-floor cattle stalls was a threshing floor and alongside was floor space for tools and implements. The space above the threshing floor and implement floor was open to the roof. Accompanying the plans was the statement that, with a few minor chaiges, "this barn would embody our idea of what a barn should be, namely, a center around which the whole farm revolves, in which all animals and implements are housed, to which all crops are brought, and from which, after having descended from roof to basement by grav-

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ity, they are again taken as manure in its very best condition."

Specialization in agriculture has on many farms, done something to that conception of one building to serve as a headquarters for chores. Cows producing 1,000 lb. of butterfat a year, hens laying 200 or 300 eggs a year, sows producing ton litters, have asked for buildings designed especially for the job. Buildings for animals producing far less than those amounts have followed pattern in many cases.

Unfortunately in many cases the question of economy has been overlooked or minimized in design and construction of these special buildings, as well as in the general barn which houses the dairy herd. Such buildings raise the question of where economy ends and luxury begins. Here and there one finds a barn whose cost is out of line with the value of the land or with the income-producing ability of the dairy herd. Such buildings do serve to give the farm an appearance of prosperity, even though the farmhouse may not. Some farmers building such barns have overlooked the fact that the barn which his herd can pay for out of income is something different from what his neighbor's herd can afford.

Money for a dairy barn is nothing more nor less than a loan to the dairy cow. Loaning money to a cow is no different from buying stock in a milk-producing factory or buying one of the bonds issued by a milk manufacturer. Hence, it is only logical that a cow should be loaned no more for buildings than she can pay back from her income, on which there are other demands such as feed, labor, veterinary fees, etc. Just as folks say "So and so has no business living in a house like that with *his* income," so it is pat to say that a herd of cows which scarcely pays feed bills can not afford to live in a barn with cork floors, or tiled walls, or with pergolas in the barnyard. The rent a cow pays *has* to come entirely out of income because cows do not have trust funds or rich uncles, can not expect Christmas bonuses or sweepstakes prizes, and thus far the government has not put them on relief.

Another way of looking at the question is to say that the dairy barn should provide everything that has been found beneficial regardless of the cow's ability to pay. In principle, there is no argument against this, but in fact it is necessary to realize that the very last word in a dairy building is not for the average cow which produces only 180 lb. of fat per year. It doesn't settle the matter satisfactorily, either, to say that a dairyman should not keep cows giving so little milk, but should sell them to the

butcher and get cows that are able to earn more.

True enough, an output of 180 lb. of fat a year is too low to enable a cow to pay for an elaborate building. The man with cows like that has as much of a cow problem as a building problem. If the cow produced 300 lb. a year, she could afford a better home with running water, electric lights, etc. There is no magic, however, that can boost the average production from 180 to 300 lb. a year. It has taken over twenty years to boost the average from 160 to 180 lb. per cow. At that rate, it would take 120 years to reach a 300-lb. average for all dairy cows in the United States.

Judging by replies which I have received from dairymen and farm structures specialists within the past few months, there is no very definite idea as to what part of her income a dairy cow can afford to pay for rent. Neither is there any general agreement as to how much the cow's owner can safely lend her to put into a new home.

An analysis of farm accounts and farm records shows how much cows are being charged for shelter and equipment in herds here and there. For instance, carefully kept records in twenty-eight Kentucky dairy herds showed that cows were spending five per cent of the gross cost of producing milk for rent of shelter and equipment. In the ten lowest-producing herds of the twenty-eight this amounted to $1.67 per cow per year. In the ten highest-producing herds it amounted to $6.40. The average of all herds was $4.01.

To hitch these figures up to a 16-cow herd, multiply the rent figure by sixteen for any one of those groups and see what a 16-cow herd could put into a new barn if the cows all decided to quit paying rent and buy. Assuming that a new barn would last thirty years, the monthly rent payments of those average Kentucky cows would add up to $1,924.80. For the sixteen best cows they would add up to $3,072. For the sixteen poorest ones, $801.60. But is it possible to build, for $801.60, a 16-cow barn that would last for thirty years? Or is it possible to build for $3,072 a barn as good as the best cows require?

Some other farm manager surveys in northeastern Iowa show an average buildings charge per year of $11 in herds producing 292 lb. of fat per cow per year. Each cow in those herds was paying 7.5 per cent of her income for rent. In herds in the same area that averaged 232 lb. of fat per cow per year, the buildings charge was $8.70, or 7.5 per cent of total annual income. In herds that averaged 162 lb. of fat per cow per year the charge was

$8.10 per cow, or 8.6 per cent of total annual income. For each $100 spent for feed on these farms, the total sales from dairy products varied from $152 down to $124.

On ninety-three carefully selected Illinois farms producing milk for the St. Louis market, each cow pays $7.72 per year for shelter. On the basis of milk, this amounts to ten cents per 100 lb. In New York, on farms where accurate accounts are kept, the annual buildings charge was just under $5 in 1939 (three cents of each dollar spent by the cows for feed, labor, etc.). Farm management analyses in Pennsylvania show an average building investment of $179.20 a cow; an annual rent of $18.25 per cow for use of buildings and equipment.

Suppose, on the basis of a low rent figure of 5 per cent of gross income, and higher figures of 7.5 to 8.6 per cent, we study the possibilities of new dairy buildings on a rent figure of 6 per cent of total annual income. The accompanying table gives the amounts available for building (no interest figures involved) over 10, 20, and 30-year periods, in herds of varying efficiency from 180 to 500 lb. of fat per head per year, with allowance for varying market prices of cream or milk produced.

An arbitrary figure of $200 is used by some farm buildings men as the investment per cow that a dairy farmer can make in buildings for his herd. In times like these where farm practices are ever changing, it is reasonable to ask whether one should spend $200 per cow for a barn to last thirty years, or whether he should try to cut the figure to $50 a cow and put up a barn to last only ten years. In the first case, if his investment is $200 per cow and the building lasts thirty years,

Rent Money Available for Buildings in Herds of Varying Efficiency
(6 per cent of Gross Income)

Annual production per cow, lb	Total income per cow	Available annually for bldg. per cow	Available for building, 10-yr. period	Available for building, 20-yr. period	Available for building, 30-yr. period
180	$ 54.00- 97.20	3.24- 5.83	32.40- 58.30	64.80-116.60	97.20-174.90
200	60.00-108.00	3.60- 6.48	36.00- 64.80	72.00-129.60	108.00-194.40
250	75.00-135.00	4.20- 8.10	42.00- 81.00	84.00-162.00	126.00-243.00
300	90.00-162.00	5.40- 9.72	54.00- 97.20	108.00-194.40	162.00-291.60
350	105.00-189.00	6.30-11.34	63.00-113.40	126.00-226.80	189.00-340.20
400	120.00-216.00	7.20-12.96	72.00-129.60	144.00-259.20	216.00-388.80
450	135.00-243.00	8.10-14.58	81.00-145.80	162.00-291.60	243.00-437.40
500	150.00-270.00	9.00-16.20	90.00-162.00	180.00-324.00	270.00-486.00

the cow investment per year amounts to $6.33. In the second case, with a building lasting ten years, the cow investment per year is only $5.00. Isn't it possible that a barn to last only ten years could be built for less than the initial investment of $50 per cow?

I have just seen plans for a good-looking one-story dairy barn capable of serving 20 or 25 cows with feed room, dairy room, loafing shed, and four milking stalls (concrete floor throughout) that can be built to meet health regulations for $20 a cow. That figure does not include silo or hay storage.

It does not necessarily follow that the most economical building is the one that costs the least to build, nor the one which the cow can rent for the lowest figure. With only six per cent of a cow's income going for rent, and her income sometimes as low as $80 or $100 a year, there can't be a huge saving if you cut the figure in half. Anywhere from 50 to 80 per cent of a dairy cow's income goes for feed, and anywhere from 20 to 40 per cent for labor. Cut the feed item even one-fifth, and the saving amounts to as much as the whole building item; cut labor item one-third, and the saving is greater than the entire building item.

To put it another way, a dairyman with a herd of big cows, feeding largely on good-quality, home-grown hay and grains, could have a feed cost so low that his building cost, if need be, might run higher. If by chopping his roughage, he can get along with less mow space, his cows can buy more barn for their money when they want to build. If by use of a trench silo he can cut the haymow capacity still more, his barn money will go still farther.

Figures and opinions I have been able to gather from here and there indicate that farm buildings experts have their hands full planning a modern, efficient barn which low or average-producing cows can afford, one that will last, and one that will retain its use value as long as it lasts. (It is possible to put up a building whose use value disappears before the building wears out.)

The head of the farm structures work at one of the leading land-grant institutions told me not long ago that the logical approach is to set up the conditions which a dairy barn should provide and design the structure as economically as possible without losing more on the other factors than he saves in housing. The head of the dairy department at one of the state agricultural colleges remarked: "Usually it is not shelter and equipment that makes the difference between high and low production." A farm

management professor at one of the agricultural colleges told me: "Practical experience indicates that the building can be too good, and we have no idea of how poor it can be before it begins to cut in on the efficiency." And a country banker told me: "When a farmer comes to us about a dairy barn, we don't ask him how much money he wants to put into a barn, but how much milk his cows average to produce in a year, and what he spends in a year for feed per cow."

These remarks indicate that the folks who are interested in dairy cow housing are not looking at the subject through the same set of spectacles. Perhaps, in part, that is why, in so many cases, the dairy herd keeps on using one corner of a dilapidated barn instead of setting up housekeeping in a home all its own.

Kudzu — A Mender of Tattered Lands

Condensed from Better Crops With Plant Food

Wellington Brink

Soil Conservation Service, Washington, D. C.

KUDZU came out of Japan and somehow got onto porches in Alabama. Down there for many years they called this legume "porch vine." It flowered prettily and was lavish with shade. Once in a while, whether by chance or by design, the vine would get a toe hold in a deep gully and do a spectacular job of roping it down, checking its further progress.

In 1923 Claude C. Hamilton, for instance, obtained from Alabama a single kudzu crown which he replanted near a wide and deep gully on the old family farm nine miles northeast of Forrest City, Arkansas. The gully was near his house, just across the road from his large peach and apple orchard. In ten years or less the vine had spread until it lined the gully and covered its bed to a distance of 100 feet. It climbed trees and threatened to kill them, but the road grader kept the kudzu cut back and the peach trees remained safe.

That is one of the misapprehensions which for years held back the popularity of kudzu—the fear that the plant, once started, would "take" the fields, that it could not be kept within prescribed bounds. Actually, the vine is an obedient child, amenable to forms of discipline easily exercised by the farmer. Fire and the plow are effective exterminators of would-be runaway runners, but the simplest way to discourage kudzu's greedy ambitions is to deliver it over to a few hogs or cows. All livestock love the stems and foliage, and a hungry porker will follow down a lush vine, consuming every morsel as he goes, even rooting out the crowns as he comes to them.

Thanks to the vision and enthusiasm of R. Y. Bailey, to the new surge for soil conservation, and to the effort to put agriculture's house in order for defense, the Nation, and particularly the South, is rapidly becoming cognizant of this once obscure but lately acclaimed mender of tattered lands. I have it on Bailey's authority that approximately 200,000 acres of kudzu have

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been established in the South, if we include last spring's planting. But there are at least 10,000,000 other acres that ought to have the soil protection that kudzu, used in rotation, can give them.

Bailey, who is in charge of the Service's agronomic work in seven Southeastern States, is the man who, more than any other, discovered, developed, and defined the place of kudzu in Southern agriculture. Early in January, 1937, Bailey wrote a memorandum, the fame of which has steadily soared as kudzu's long fingers have inched out across thousands upon thousands of wasting acres. He knew that terraces could never be relied upon to check erosion on the steeper lands. And it is on the more sharply angled segments of Southern farms that soil losses from beating rains create a control problem at its baffling worst.

Bailey's observations led to this conclusion: "The critical slopes present one of the most difficult problems in the control of erosion. . . . The soil washing from such areas during heavy rains silts and clogs up terrace channels below, causing breaks in the terrace ridges. Gullies started in the steeper portions of a slope usually extend to the area below, thus causing considerable damage to land on which erosion could be controlled if the steep area above was brought under control. The material from these slopes may be deposited on lowlands, rendering them useless."

Having thus established the premise, Bailey extended his reasoning thus: "Any practical solution of the problem of controlling erosion on critical slopes within a cultivated field should greatly simplify the problem of controlling the remainder of the field. . . . Permanent vegetation seems the answer. . . . The vegetation should be some kind of forage crops rather than trees. . . ."

Kudzu, naturally. Bailey had learned to know his kudzu as a father knows his child. He knew the great Southeast—its plants, its terrain, its soils, its people, its economy. Well he knew the serious crisis that was mounting as erosion bit away at the South's basic resource of farm fertility. And he chose kudzu as best fitted to hold back the destruction and to begin the work of rehabilitation.

As a result of his quiet campaigning, others began to talk of erosion control in terms of critical slopes and kudzu. Experimental starts were soon made. Shortly a farmer demand for kudzu seed, crowns, and seedlings was born. Soil Conservation Service nurseries were assuming an added propagation program.

In 1939 a total of 15,000,000 seedlings for transplanting were produced in these nurseries. The

next fiscal year, 26,000,000 seedlings were send out by the nurseries. Production in 1941 numbered 30,000,000. And during the twelve months beginning the first of July the output is expected to jump to at least 40,000,000.

The plant is perennial — survives from year to year. It is leguminous, which means that it is a bearer on its roots of those soil-enriching nodules which are miniature nitrogen-producing factories. The large, fleshy roots sometimes assume the most curious shapes; they are said to yield starch of excellent quality, and the main branches often measure four to five feet.

From a well-established root the vines often grow 40 to 60 feet in a single season, producing a profusion of very large leaves. Although the full possibilities of by-products have not been explored, it is known that from the tough fiber of the inner bark can be made a cloth in which are combined fineness and remarkable strength. The stems are slender, hairy, twining. The flowers are pea shaped, purple in color, occuring in axillary spikes late in the growing period. The pod is large and flat; the vine hardy, extremely rapid in growth. In certain situations, kudzu has a high rating for ornament and shade. Propagation is by crowns, by seedlings, or by cuttings. In the North the plant dies to the ground in the winter; in the South the top becomes woody. Set the crowns around the rim of a gully, behind check dams, at intervals over a sharp slope, and chances are that in one season the vines will grow over the afflicted areas, affix themselves to the pitted faces of the slopes and the scourged water channels, and effect a healing or at least a control of the process of erosion.

Because of kudzu's promise as an all-round wonder-worker (it not only stops abruptly rain-wrought ruination of agricultural lands, but also can be fed and grazed and cut for hay during its work of building back), Bailey is searching all production possibilities. Southern farming needs kudzu and more kudzu, needs it quickly and in quantity. For that reason Bailey is beginning to encourage the production of seedlings by farm boys and girls who can grow the plants in good garden soil much as they grow beans or carrots. And although kudzu is a shy bearer of seed, there's a worth-while job and a fairly profitable one waiting for American youth who will locate favorable areas and undertake the collection of seed.

But while Bailey and his coworkers are concerned with the problem of obtaining planting materials, they are equally intent on assuring the complete success of stands.

Kudzu, to do a first class job, must get off to a proper start. Planted right, fed amply, groomed well by clean cultivation along the rows, kudzu will thrive and more than pay for itself. The rule is to nourish the crop in proportion to the use that is made of it; kudzu given two cuttings in a season demands more fertilization that that which is cut but once.

Trials on various soils of the Southeast have shown conclusively that manure and phosphate stimulate the growth of kudzu and produce a stand more quickly. Bailey emphasizes the importance of care in the handling of seedlings intended for planting; advises plowing deep enough to get at least six inches of fleshy root with each crown.

The rows should be prepared 12 to 18 feet apart by breaking a strip approximately five feet wide along each row. A deep furrow is laid off. Two to three tons of manure, if available, and several hundred pounds of suitable fertilizer are applied in the furrow. There are six furrows to the row, to form a broad flat bed. These are prepared as early in the fall as possible to allow settling. Plant roots are not brought into direct contact with manure. The manure and fertilizer are often distributed on the surface and worked into the soil after the plants are set. Bailey says that kudzu may be set on every fourth and fifth cotton row without preparation, provided fertilizer is applied and thorough cultivation given after planting. On steep, terraced areas, plants may be set five feet apart on the terraces, row crops being grown in the intervals between terraces for two or three years.

In gullies or rough areas where horsedrawn equipment cannot be used in preparing the soil, Bailey suggests that hills be prepared twenty feet apart each way. Each hill should be eighteen inches square, fifteen inches deep. Manure and superphosphate should be applied and mixed with the soil. Two seedlings go into each hill after rains have fallen sufficiently to settle the soil.

Bailey's plan calls for spacing of plants in rows to give 500 per acre. He has an arithmetical trick by which he divides 88 by the row width to arrive at the right spacing within rows. Where hay production is desired, Bailey's tip is to broadcast 400 to 600 pounds of superphosphate per acre (or its equivalent in basic slag), and disk the field just before growth begins the second or third season.

Kudzu willingly and capably repairs the hurts of stricken agriculture wherever they are found.

Livestock in the Family Food Program

Condensed from Extension Animal Husbandman

K. F. Warner

U.S.D.A., before the Extension Section of the American Society of Animal Production

I want to say just four things on the topic of fitting livestock into the family food supply program.

First, it takes a lot of food to supply a family during twelve months. Second, that pile of food must include a great variety of product. Third, if many farm families are to have an adequate quantity and variety of food they will have to grow much of it themselves. Fourth, livestock is an essential part of any food supply program as well as being the basis for a sound diversified agricultural defense.

Did you ever see the amount of food needed to supply a family of five put up in a single pile? It is a rather breath-taking sight. Even a child of five needs around 1,300 pounds of food during the twelve months, including milk. Father and the hard working boys will consume almost a ton each. The total yearly needs for that family of five will weigh over 8,000 pounds. Careful planning and conscientious effort are needed if this great supply of edibles is to be available when the family needs it.

The careful planning of our daily and weekly diet on the basis of the nutritive values of the respective foods is the most effective way to insure nutritional health for the family. The shotgun recipe for a balanced diet, however, is to provide a variety of foods.

The following estimate of the yearly food needs for a family of five worked out by the U.S.D.A. Bureau of Home Economics gives a clear picture of the quantity and variety of foods needed if the family is to maintain itself on even a moderately adequate basis:

Milk	1,525 quarts
Butter	125 lbs.
Other fats	175 lbs.
Lean meat, poultry, and fish	675 lbs.
Eggs	125 dozen
Dried beans, etc.	65 lbs.
Tomatoes and citrus fruits	500 lbs.
Green or yellow vegetables	800 lbs.
Potatoes	800 lbs.
Flour and cereals	1,000 lbs.
Other vegetables and fruits	1,000 lbs.
Sugar	300 lbs.

Reprinted from Extension Animal Husbandman, Washington, D. C., Dec., 1941

If many farm families are to have these necessary quantities and varieties of food, they will have to grow a lot of it themselves. Cash incomes will rise and fall through the years as does also the cost of farm operations and purchasing power of the dollar. The history of farm families has been that cash income is rarely adequate to purchase all the things the family really ought to have. One of the advantages of living on a farm is to reduce the need for cash by producing many of the things the family needs at home. Whatever the market price of a pound of meat or a bushel of potatoes or a quart of milk, there is the same nutritional value in these products. A store of home-preserved food is a savings account on which the interest rate is never lowered.

Farm families who operate on a strictly cash income basis selling what they produce and buying back all the things they need industrialize their operations and make wage hands of themselves. Victims of unpredictable price changes, they expose the family to the full fury of every economic storm that blows. Hard times will always be tough times for every group of farmers no matter how they operate, but those with home-grown food can have nutritional health, come boom or depression.

The first lien on the family income is for food to feed the family. The second lien is for housing, clothing, and other family supplies. The third lien is for operating expenses such as labor, twine, and threshing bills. Government takes the fourth cut in taxes. Interest on the so-called first mortgage is the fifth lien on income, with repairs for fences, machinery, buildings, etc., sixth. Curtailment of the loan is a poor seventh, and improvements to the place and profits are a dust-covered eighth and ninth.

Livestock is an essential part of any food supply program. If 675 pounds of meat are needed as part of a moderately adequate yearly diet, plans must be made for producing, feeding, and preserving a couple of husky calves or a fat yearling, two or three hogs, perhaps a lamb or two, and some chickens. If there are to be calves, there must also be cows. This makes possible the production of the dairy products needed, and with the garden, orchard, and berry patch rounds out the home production of protective foods. Such a farming system requires some buildings, some equipment, and a large amount of chores. There are those who say that this is an age of specialization — that a farm family should discover its most profitable crop and then spend full time producing it, buying most of its needs at the retail

store. Perhaps there are some such situations, but my observations would indicate that they are very few. The produce from the cow, sow, and hen are just as essential by-products of normal farming as are hides, bone meal, and soap, the by-products of the packing industry.

The principal business of the meat packing industry is to sell meat, yet the success of that business has depended on its utilization of by-products. It seems just as reasonable to expect farming to be successful with a man spending all his time on the seat of a tractor as it would be for a packer to expect to compete successfully if he spent all his time merely dressing and selling beef.

We believe thoroughly in the value of diversified farming. It makes for a sounder, more elastic, more easily defended business. Feed production with forage, pasture, and silage, are an essential part of such diversification. In turn, livestock is necessary if full value is to be obtained from these home-grown feeds. It may not always be necessary or even desirable to make these livestock operations extensive or to include every class of animal on every farm. But I can think of no better defense against the future than for a family to make full use of its labor and equipment at chore time.

Fitting livestock into a food supply program is an effective way to keep both the farm and farmers fit.

Agriculture in South America

Condensed from The Dakota Farmer

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PRIOR to the conquest of Peru by the Spanish conquistadors in 1535, the Andean region and the west coast of South America had a highly developed agriculture. In four different geographic regions there had developed intensive agricultural civilizations. Just when each of these cultural centers began is hard to say but all seem to have been overthrown by some agency between 800 A.D. and 1100 A.D. probably by the advent of the Incas and their rise to power around Cuzco, Peru.

Along the coast of Peru the Pre-Incan people of the Chimu (immediate predecessors of the Incas) period built their dwellings, their temples, their pyramids from clay. They ornamented their walls with the same geometrical designs they used in their textiles. These pre-Columbian peoples were marvelous weavers — they made extensive use of their animal fibers; the llama, alpaca and vicuna wools, and of two vegetable fibres, American cotton and bast fibre of the agave plant. They used the simple spindle for spinning their yarns, and their descendants still spin as did their forbears centuries ago.

The Incan civilization was a State - dominated communistic culture. The corn raised by the farmers in the irrigated valleys helped feed the shepherds in the hills. They knew the meaning of drought and were never without their "ever normal" granary in the possession of the State. In the more mountainous areas terrace irrigation was extensively practiced and fertilizers were used skillfully. Throughout the tropical parts of South America the early Indians made wide use of both the poisonous and non-poisonous manioc, or cassava, and that use persists to this day. The Indians of the colder Andean highlands depended upon the potato for starch instead of the manioc. In the very cold highlands an early maturing grain millet called quinoa was an important cereal. In all of the warmer regions of South America

Reprinted by permission from The Dakota Farmer, Jan. 24, 1942

the sweet potato was known at an early date.

The early Peruvians and Bolivians did not use tobacco; they depended on chewing coca leaves mixed with lime for stimulation, and their descendants still do.

The llama and the alpaca were domesticated by the Peruvians and Bolivians; the llama primarily as a beast of burden, and the alpaca as a source of wool.

During the period of the development of the Andean and west coast civilizations the great forested areas of Brazil, Colombia and Venezuela were sparsely inhabited by nomadic tribes, a condition that existed until the advent of the white man. Larger populations probably existed on the plains of Argentina, Uruguay and Paraguay. The white men who came to South America were Spanish and Portuguese adventurers, largely single men, in search of gold and precious stones. They waged a ruthless campaign of extermination and of exploitation but they won a continent for Spain and Portugal.

The Spanish occupation brought to this new world the crops of the old world: rice, olives, figs, oranges, lemons, sugar cane and wheat. Every Peruvian child to this day is taught the romantic story of the introduction of wheat into the western hemisphere. The early conquistadors imported barrels of rice from Spain. It seems that the Dona Ines Mundoz de Alcantara, a sister-in-law of Francisco Pizarro, is supposed to have found a few grains of wheat in one of the barrels of rice, planted them, and thus added wheaten bread to the dietary of Peru. Incidentally the modern Peruvian largely depends upon wheat imported from Chile.

The pattern of agricultural development laid down upon South American agriculture during the Spanish and Portugese colonial period has made an indelible impression upon the agriculture of the continent to this day.

The crude wooden Spanish plow supplanted the Indians' digging stick. The Spaniard hitched his oxen to that plow. The pre-Spanish people never had a draught animal although they used a llama as a beast of burden. The Spaniards and the Portuguese brought horses, cattle and sheep. Spain and Portugal still lived in a feudal economy; they transplanted that pattern of land use and ownership to South America. Early Spanish explorers and military heroes were awarded land grants called encomiendas. The Indians went with the grant. The grantee, called an "encomiendero" used the Indians to farm his land, and collected other tribute from them while at the same time he was supposed to provide for the physical and

spiritual welfare of his people. This system was, of course, terribly abused, and the present day peasants, inheritors of this pattern of land ownership, still suffer under it.

Chilean Agriculture

Chilean aristocrats have acquired huge estates served by generations of peasants called iquilinos. The great estates are called fundos or haciendas.

The Chilean census of 1935-36 lists 202,000 agricultural holdings of which 112,500 are well developed. Earl P. Hanson in his "Chile, Land of Progress" (1941) states that agricultural area in Chile covers some 59 million acres of which 53% is in estates of over 12,000 acres owned by only 558 proprietors. Some 63,000 farmers own only 1.7% of the land in lots ranging up to 50 acres. Fifty-five percent of the land owners of Chile own less than 2% of the land and one-half of 1% of the land owners own 53% of the land.

The present day agricultural policy in Chile is helping the small land-owner through governmental promotions of agricultural co-operatives, government credit facilities, and marketing help. There were 38 agricultural co-operatives in 1940 with about 2,000 members. These include dairy, fruit, beekeeping, brandy, milling, and farm machinery co-operatives. Chile is bending every effort toward the creation of a strong middle class that might stand between the huge estate and the little land owner.

Chile's agriculture occupies the great central valley lying between a low coast range and the Andes. Wheat is the principal crop amounting altogether to about one-fourth that of the annual crop of Kansas, most of it grown without irrigation, largely along sides of foothills of the irrigated central valley. Lentils of high quality are a leading item in their normal export trade. The loss of the lentil export market has driven them back to more wheat, and on the poorer lands to more grapes.

Chile's agricultural economy is still that of the ox-drawn two-wheeled cart on the small farms, and to a large extent even on the big estates but tractors and trucks are beginning to come in. Butter and cheese, once made in the homes, are beginning to be made in sanitary creameries and cheese factories. Condensed and powdered milk are being made. There is a nation-wide program to encourage the consumption of milk. Grapes rank next to wheat in area of land used for their production, and they are almost entirely converted into wine.

Chile is not self-sufficing with respect to beef for she imports much from Argentina. The central valley has a climate much

like California, marvelous for fruit but it is a long way from a market.

Brazilian Agriculture

When the Portuguese arrived in 1500 they found the natives using the taro root, the manioc root and maize as valuable carbohydrate foods, and yerba mate and guarana as refreshing beverages. The forests supplied them cashew nuts, coconuts and cacao. Tobacco was known and used. Livestock was unknown.

Sugar cane was introduced in 1502 and sugar became a valuable export by 1562. By 1650 Brazil was the leading sugar producer of the world. Livestock production became important by the beginning of the 18th century. In 1703 a ranch for raising cattle for cheese production was established.

Coffee was introduced in 1730 but its extensive planting in southern Brazil where it now flourishes began in 1810.

With the separation from Portugal in 1822, and particularly during the long reign of the benevolent emperor Don Pedro II, much governmental aid was extended to agriculture. An Imperial Institute of Agriculture was established in 1860, with a program for plant and animal breeding, better machinery, agricultural education, seed introduction, etc. A School of Agriculture was established in Rio de Janeiro as early as 1838. The very useful Instituto Agronomico de Campinas in Sao Paulo was founded about 1885.

Brazil became a republic in 1889. Agricultural development was pushed to include a great expansion of livestock and veterinary work, the making of alcohol from sugar cane; the better processing of manioc, and more recently irrigation. Campinas Experiment Station may be credited with developing a successful cotton industry for the nation, and with being of constant service to the coffee industry.

Coffee

As citizens of the United States we have a big stake in the coffee business of the world. One compiler of world statistics says that the annual per capita consumption of coffee beans in the United States is 9.68 pounds compared to 9.46 pounds for Holland; 5.37 for Germany; 0.66 pounds for England and 0.22 pounds for the U. S. S. R. Coffee is the principal cash crop of seven Latin American countries. The business went along well until about 1900 when it began to expand too rapidly, as cheap European labor began to migrate to Brazil. Sao Paulo tried control through limiting plantings but this plan failed because of increased yields from new plantings set out before the new law became operative.

Then they tried the valoriza-

tion scheme. This was really a government price advance to enable the producer to hold his coffee off the market, plus a promotion scheme to increase consumption abroad. The scheme worked so well from 1906 to 1912 that they dropped it in 1912, but as soon as World War No. 1 came on they used it again. In 1921, the Brazilian government started buying again and has been the big buyer ever since. Since 1931, the Brazilian government has burned or destroyed some eight billion pounds of coffee, an amount equal to what the United States uses in four years. The beginning of World War No. 2 in 1939, and the loss of the European market, again brought on a bad situation in the Coffee Hemisphere. This led to the Inter-American Coffee Agreement of November, 1940.

This agreement prescribes the maximum amount the United States will purchase from any one of the Latin American nations; sets up a quota of coffee exports from each based on past sales; provides a small quota for U. S. coffee imports from other than Latin America, and provides an export quota for Latin America to countries other than the United States. The agreement became effective April, 1941, and retroactive to October 1, 1940. Because of shipping difficulties brought on by world events and some price-fixing in Latin American countries coffee prices began to rise unduly in the United States last June so the Inter-American Coffee Board increased the United States import quota by 5% and made provision for advance shipment of 15% of next year's quota to be held here stored in bond. Some of the exporting countries then raised their fixed prices to counteract this. In August, the United States basic quotas were given another 20% increase.

Eugene Butler, editor of The Progressive Farmer, writing in the September, 1941, issue of that magazine said: "In the state of Sao Paulo there is suitable cotton land equal to the present cotton acreage in the United States. In addition to Sao Paulo there are several other states in the South Brazilian plateau in which land suitable for cotton may be had." Butler then sums up the question of Brazilian cotton competition as follows:

"It is up to our farmers to improve quality and lower production costs by increasing acre yields. There is no chance to lower acre costs to meet those of Brazil because the United States cotton production is geared to a national price level and standard of living which make that impossible." We have certain advantages in quality production of which we should take full ad-

vantage. If we can grow a uniformly good cotton and gin the crop and wrap it properly, the mills of the world will take it if the difference in price compared with Brazilian staple isn't too high.

"At present it seems that Brazil can grow cotton for five or six cents a pound below our costs. But if by better acre yields we could lower our costs say two cents a pound, by improving quality add one cent a pound to the price, then the cost margin in Brazil's favor would be only two or three cents a pound."

Brazil, like most of the rest of the South American countries, started as a pastoral country. The very first Portuguese introduced cattle which increased rapidly and ran wild. Her exports of livestock products were largely hides and Xarque (dried beef) until about 1900. She began to export fresh beef about the beginning of World War No. 1. By 1939, she was exporting over 83,000 tons of beef including over 38,000 tons of canned beef. The meat production of Brazil is 15% more valuable than her coffee production.

Zebu or Brahman cattle, and their disease and insect resisting crosses upon the old native or "caracu" cattle, are to be found in every state in Brazil. These hardy cattle are stabilizing and increasing the greatly needed supplies of high protein meat and dairy products. The water buffalo, introduced from the Orient, is also supplying an important source of butterfat.

Brazil is distinguished for her extensive natural forests which occupy practically half of her area. Her forest products include timber, mostly the hard Parana pine from her southern states, carnauba wax from the carnauba palm which grows in her drier northeastern states, the Brazil nut from the Amazonian areas, three trees whose nuts yield valuable oils, namely the babassu, the coconut and the oiticica. Then there is the yerba mate, and important medical plants including cinchona (source of quinine), copaeba, derris and timbo roots (source of rotenone, a valuable organic insecticide) and Pyrethrum.

The United States of Brazil embraces over two billion acres of land but only about 80 million acres or about 4% is being used.

The five leading crops in terms of value and in order of importance are coffee, cotton, corn, rice and manioc.

Sugar cane occupies sixth place, closely followed by oranges and beans.

Other crops of importance are tobacco, cacao, bananas, castor bean seed and coconuts.

Pork Progress

Condensed from American Hampshire Herdsman

Lew Reeve

THE sow testing work in the Austin, Minn., Area was started in the spring of 1938 by P. C. Holand and has been carried on continuously since then through an arrangement with the State Department of Education. One of the chief reasons for the rapid growth of this work is that Mr. Holand, a successful administrator, has spent the greater share of his time in the field, supervising the work.

This method of production testing calls for a detailed record of every sow in the herd. It requires the ear-marking of each of the pigs and the recording of their weight at 56 days and, if possible, again at 160 days. These records form the basis for the selection of the breeding stock to be retained, as it has been found that the litters that weigh the heaviest at 56 days invariably are the heaviest at 160 days. In fact, the correlation has been about 75%. Likewise, the fastest gaining pigs have also proven to be the most economical gainers.

The Association has increased from 53 to 111 members since 1938. There are many more in the area who are practicing the plan but are not actually enrolled in the Association. No less than 73% of the members are able to show an improvement in their records.

The following figures will show the extent of the progress made:

	Avg. Wt. 56 days	Avg. Litter Wt. at 56 days
1938	30.7	240.6
1939	30.01	244
1940	31.9	255
1941	32.4	258

As fine as this work is, the work is not complete without a carcass study. Therefore, littermate barrows to the gilts retained for breeding have been slaughtered and a study has been made of their carcasses. A very pleasing fact came to the surface when some of the fastest growing litters were marketed under the carcass yield and grade plan. The killing records of these hogs were some of the best that we have ever had, indicating that the fast growing pig is also a good killer; we mean that he yields a better than average number of pounds of pork, as well as better than average quality of pork.

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My remarks so far explain how to make real progress in the business of raising good hogs by the use of test records. I do not mean to infer that this should be the only basis for progress, as showring judging does have its place. This judging has done a lot in the past to improve all of our breeds of swine and it is just as important now as it has been at any time in the past. But live judging alone does not do the job well enough.

In searching for the answer to this failure, I believe that we can safely say that only part of the live judging requirements have pork as their goal. This requirement can be divided into two categories—those of practical nature and those which are pleasing only to the eye. That part of the judging which falls in the last category varies considerably, depending upon the opinion of the judge. On the other hand, the practical factors, plus production records, form the most logical basis for swine improvement yet known, can be duplicated and we believe will stand the test of time. The test records are more easily applied because they are easily interpreted. They are b a r e facts—not opinions.

Testing the production of b r o o d sows determines the growth rate. The fastest growing pigs are the most economical gainers according to data of many practical hog producers, as well as research men. In our carcass study in connection with the sow testing work in the Austin area, we found indications that the fastest growing pigs will be the highest yielders and have the most valuable carcasses, if marketed at proper market weights. We find an increasing number of men in the sow testing work who are selling their hogs on a carcass yield and grade basis.

To explain this basis, it should be understood that it is based upon the live market of hogs, which is the price that a packer believes hogs are worth along with the demand that he has for them. I think it well to remind you at this point that the live price quoted is not so much a set price, but rather an interpretation of the value of the entire collection of lard and pork cuts. The provision man assembles the facts on the pork trade and live hog situations and expresses his interpretation in the form of a live hog market. It is set to cover a certain average yield. The average yield is checked often and if the packer sees a rise or fall, he changes the price which he can pay accordingly. Speaking in terms of present-day values of $10 per hundred for live weight hogs and an average yield of 66⅔% for medium weight butchers, the value of the carcass can be determined by dividing

the live market price by this average yield, or $10 divided by 66⅔% equals $15, or the carcass value of hogs per hundred.

A 200 pound hog, yielding 66⅔%, packer style dressing, would have a carcass weighing 133.2 pounds, which figuring at $15 per hundred would make the carcass worth $20, or the same as the live hog weighing 200 pounds at $10 per cwt. If we should take a hog above the average on the same $10 market, which would yield a 137.2 pound carcass, we would then have a yield of 68⅔%, or an increase of 2%. A 137.2 pound carcass times $15 per hundred would make the carcass worth $20.60, which would be worth $10.30 per hundred live weight or 30 cents per hundred more than the average hog.

This example shows what an increase or decrease in the yield would mean for a hog above or below the average. How has this worked in 201 lots that we have bought on this basis since June, 1940? Four percent have been under standard, the producers receive 1 to 30 cents discount per hundred; 6% have been standard, the producers receiving the same amount as if selling on the live weight basis; 90% have been over standard, the producers receiving 1 to 75 cents over the standard price with the average ranging around 18 cents above. This makes it very evident that yield is one of the most important factors in determining the value of carcasses and it cannot be under-estimated.

The fill on a hog is an abused practice, which is unsound and wasteful. The last-minute fill is never assimilated into living tissue. Nothing can develop from it that a buyer can sell. It is all pure waste—a nuisance and a hazard. We have found that test hogs of the same weight and appearances, which look alike, vary as much as 4% in their yield. Under present prices, this would mean 60 cents per hundred. We repeat again that yield is easily the most important value-determining factor and cannot be estimated accurately by the buyer or seller.

Of second importance is the grade. We have established four grades. These grades are set up to reflect its cut-out value. No. 1 is a carcass with the proper amount of condition and confirmation. No. 2 is over-fat. No. 3 is the under-finished hog, or one that lacks in quality. No. 4 is poor, lacks quality, has thin hams and inferior bellies. The penalty that we inflict varies from 20 cents per hundred on the No. 2 grade to $3.10 per hundred on the No. 4. The following percentages show how the lots have graded so far: 82%, No. 1; 14%, No. 2; 3%, No. 3; 1%, No. 4.

Buying on carcass yield and grade basis has not yet proved successful in interesting a large percentage of producers to the point of actually selling their hogs by this plan. However, there has been a considerable increase in this method this year over last year: 103 lots with a total of 2,796 hogs in 1941, as compared with 41 lots and 746 hogs of the year before.

We have done a lot of research work in an attempt to find out the ideal way to pay a farmer on the meat value of his hogs, but up to the present time we have had to compromise on the carcass yield and grade basis. These two factors are the most important factors in determining the cut-out value of the hogs. It is where the plan gets its name—carcass yield and grade basis. A system, which would pay the farmer on a strictly cut-out value, needs more study and research work. However, the present system does afford an opportunity to give the farmer an incentive to raise good hogs. It offers another advantage which cannot be under-estimated, in that the government furnishes us with a report on the health and bruises of each lot. This is very vaulable information, both for the processor and the producer. The report we supply the producer on the settlement sheet informs him of the presence of disease in his herd and gives him an opportunity to take immediate action and correct it.

Machine Plants 8,000 Trees a Day

Condensed from Kentucky Farmers Home Journal

THE latest development for use on the shelterbelt of the Prairie States Forestry Project is a machine that will plant about 8,000 trees or shrubs a day. According to the U. S. Department of Agriculture this is about 2,000 more trees than a 12-man crew using hand tools will plant in a day.

Work on this machine began in 1936 in anticipation of a possible labor shortage at some time. In 1938, one and one-half miles of shelterbelt were planted with the machine, then two years elapsed while various improvements were made, chiefly in reducing weight. In 1940, five miles of field wind-breaks were machine planted in Nebraska.

Survival and growth of these machine-planted trees were carefully watched, and were found to equal those planted by hand in the same vicinity. Examination showed that the moist dirt was packed firmly around all the roots as well or better than hand planting.

The planting machine is mounted on an implement called a "unicarrier" and forms a unit which may be readily attached to or detached from this unicarrier. To it are commonly attached plows, discs, tillage tools and other similar farm equipment.

To make hand planting easier by providing a bed of fine soil around the young tree roots, the unicarrier may be used. In this case, it is the chassis for the heavy steel blade or shank which is used as a sub-soiler to break up the ground to a depth of 14 to 16 inches, or more than double that of the ordinary plow bottom.

The subsoiler is retained in the tree-planting machine, with two steel shoes attached behind it to hold open a trench approximately three inches wide, 12 inches deep and long enough for a tree to be set in the slot so formed.

An ordinary tractor delivering from 15 to 20 drawbar horsepower can handle it without difficulty, and move it from farm to farm on its own wheels. Two men comprise the "crew" on the machine, alternately placing trees in the trench and holding them in position until the double pacing wheels directly behind the blades firm the soil around the tree roots. Equipped with a clicking device, the machine signals the tree-handler when a tree is to be placed.

Resembling a vegetable plant

Reprinted by permission from Kentucky Farmers Home Journal, Jan., 1942

setter in some ways, the tree-planting machine is on a much larger scale, but differs in that no water is used in sluicing the trees into place.

While the machine is entirely suited to the relatively deep, level soils of the Prairie-Plains region, it is not adapted to steep and rocky slopes. A special "friction-hitch" is used on the trencher of the machine so that rocks or obstructions will not injure it or the operators, thus making it usable on all types of soil from blow sands to heavy clay.

Vitamin B Research

Condensed from Farm Journal and Farmer's Wife

Newest bit of research in the more recently discovered vitamins in the vitamin B complex is an experiment now under way at Rutgers University where eleven Berkshire pigs (more will be added) are being kept indoors and fed a synthetic ration made up of purified milk casein, dextrose, minerals (in pure chemical compounds), fat (Crisco), and cod liver oil.

All pigs get that ration, but one group of them gets, in addition, pantothenic acid; another group gets the ration plus all known B vitamins except pantothenic acid; a third group gets all known vitamins (including pantothenic acid) and, in addition, dried beef liver. All vitamins used are in pills or capsules, and are fed with a bolling gun—the instrument that veterinarians use to administer worm capsules and other medicine. Feed for these pigs will cost $25,000 a year.

Results of this work, supported by the Merck Institute for Therapeutic Research, should show how much of the recently discovered vitamins are required in a pig's ration. The primary objective, however, is to find out how to improve the human diet, although the researchers will, of course, learn a lot about improveing a pig's ration.

The pig's digestive tract is, in many respects, similar to that of man. The pig is also susceptible to certain blood diseases that are like pernicious anemia in man. The skin of a young pig is more like the skin of a human than is the skin of any other animal. This is important, because many vitamin deficiencies first show up as lesions on the skin.

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Watch Bindweed Seedlings

Condensed from Kansas Farmer

F. L. Timmons

Fort Hays Experiment Station

A serious problem now confronting farmers who have eradicated bind weed is how to prevent their land from becoming reinfested from bindweed seed contained in the soil. According to a report issued recently 9,295 Kansas farmers have eradicated bindweed or have completed one or more years of intensive cultivation on 60,088 acres of infested land during the last three years. The task of keeping this land free from bindweed, once the old plant and root system has been eliminated, is nearly as important as that of eradicating the original stand. Fortunately, present information indicates that bindweed seedlings can be effectively controlled by good farming methods that are now being practiced regularly by many farmers on non-infested land.

The number of bindweed seeds remaining in the soil after eradication of the old plants will vary a great deal according to (1) eradication tillage methods, (2) age of the infestation or the number of seed crops produced, and (3) climatic conditions and ability of the bind-weed plant to produce seeds.

Some infestations have been known never to produce seeds. It is believed that the soil in some infested areas is heavily populated while that in other areas contains very few bindweed seeds? Generally speaking, the longer bindweed is allowed to remain on land, the more serious will be the seedling problem after eradication has been accomplished. Any delay in beginning eradication treatment of bindweed compounds the interest on the mortgage which the weed holds on the land by increasing the number of seeds in the soil.

Bindweed seeds have a hard, thick outer coat or shell that is impervious to water and causes a considerable percentage of the seeds to lie dormant in the soil many years before germination. Observations at the Fort Hays Branch Experiment Station, on areas where bindweed has been present for 20 to 30 years, show

Reprinted by permission from the Kansas Farmer, Topeka, Kansas, April 19, 1941

that seedlings continue to emerge in large numbers for at least 5 to 8 years after the original bindweed has been eradicated. A thick stand of bindweed seedlings came up in the spring of 1928 on one field from which all old plants had been eliminated in 1920. An average of 66 seedlings to the square rod emerged in the spring of 1940 on an area that had been free from old bindweed plants since 1936, and on which no seed had been produced after 1935.

Bindweed seedling emergence tends to be heaviest in the early spring, but it may take place at any time during the growing season when the soil is moist within 1 or 2 inches of the surface. Bindweed seed will germinate occasionally when the soil is too dry near the surface to sprout the smaller seeds of many annual weeds such as pig-weeds and Russian thistles.

A newly emerged bindweed seedling has two somewhat heart-shaped leaves notched at the top resembling those of a seedling radish. These remain attached at the base of the vine for several weeks and serve as an easy means of distinguishing a seedling from an old plant after the seedling has developed several of the characteristic arrow-shaped bindweed leaves.

A bindweed seedling a month old can be killed by cutting it off once to a depth of 3 to 4 inches with a hoe or other cultivation implement. Younger seedlings are killed as easily as the seedlings of other plants when uprooted or cut off by any kind of farm tool.

Studies made by Dr. J. C. Frazier, of Kansas State College, at Manhattan, show that the average bindweed seedling at the age of 6 weeks has developed a root system 12 inches deep with a lateral spread of 7 inches. Seedlings at that age usually cannot be killed by an ordinary cultivation 4 or 5 inches deep, but will nearly always send up new shoots from below that depth. Obviously any successful method of preventing bindweed seedlings from becoming established must not let them grow more than a month between cultivations when the land is not in good stand of close-drilled or intertilled crop.

In an experiment which has been under way at the Fort Hays Station since 1937, both wheat and sorghum grown continuously or in rotation with fallow were effective in preventing reinfestation of the land by bindweed seedlings where good stands of crop were obtained, and where the cultivation was thorough enough to destroy all annual weeds once a month in inter-tilled crop and during periods between harvest and seeding. On the other hand, when the stand of

wheat was thin or spotted, or the land was allowed to remain in stubble after harvest without cultivation during the remainder of the season, or when the sorghum row crop was cultivated indifferently, many bindweed seedlings were able to establish themselves so that ordinary cultivation did not kill them.

Fields from which bindweed has been eradicated should be given careful attention under a system of superior farming practice for an indefinite number of years. Close-drilled sorghums and small grain crops or good summer fallow methods appear to be the most suitable for this purpose, but row crops are usually satisfactory if thoroughly intercultivated. When the stand for close-drilled crop is thin or spotted it should be destroyed early in the season and the land prepared for another crop, or it should be plowed deeply immediately after harvest and closely observed for bindweed plants that may have established themselves.

The number of extra cultivations required for bindweed seedling control, that would not otherwise be necessary to destroy annual weeds, usually does not exceed 2 or 3 each season. The cost of these extra cultivations is small, but the danger of reinfestation if they are omitted is great. This was demonstrated on one area on the Bindweed Control Project at Hays in 1940. A portion of a field which had been free from bindweed since 1937, but which had a uniform emergence of seedlings in the spring of 1940, was not cultivated until June 15 and was given a second cultivation August 15. The seedling plants had established themselves and spread so rapidly that in October there was almost a complete stand of bindweed that would require at least a year of intensive cultivation to eradicate.

Another portion of the same field was cultivated for the first time May 15 when the bindweed seedlings were about a month old. The plot was given four additional cultivations during the season at intervals of about a month, and when wheat was seeded in early October there were no bindweed plants. A third part of the field was cultivated May 15 and again June 1, at which time it was listed to kafir. The crop was cultivated only twice during the season but this was sufficient to prevent any bindweed seedlings from becoming established. Thus two extra cultivations in one case and three in another had meant the difference between a field free from bindweed and one almost completely reinfested. The extra cultivations were necessary in both cases in maintaining the fallow for wheat and in producing the

crop of kafir, so no additional expense was involved in controlling the bindweed seedlings.

The growing of perennial crops on previously infested land eliminates extra cultivation costs, but is likely to extend the time during which bindweed seed will remain dormant in the soil as compared to land that is stirred frequently under annual crop production. Alfalfa is probably the most suitable perennial crop for controlling bindweed seedlings, but its effectiveness for this purpose has not been definitely determined.

There is a possibility that an occasional bindweed seedling will survive crop competition and escape destruction by cultivation even under the most carefully planned and persistently followed cropping system. For this reason, it is important that a careful watch be maintained for many years on all previously infested fields for individual bindweed plants or small patches. These can be eradicated with little difficulty or expense by treatment with sodium chlorate if they are found and treated before they are more than a year or two old.

Control of bindweed seedlings on chlorate-treated land in uncultivated areas, such as fence rows and roadsides, presents a somewhat different problem than that in cultivated fields. The length of time during which seedlings will continue to emerge on uncultivated land is believed to be much shorter, since seeds have usually not been buried deeply by cultivation but remain near the surface subject to conditions which encourage germination. A considerable percentage of the bindweed seed on chlorate-treated land in uncultivated areas apparently germinates and the seedlings are killed while the effect of the chlorate treatment is still present in the surface soil. On the other hand, some seedlings do emerge in many cases after the effect of the sodium chlorate is diminished and, unless control measures are taken, frequently reinfest the land. Where salt has been used to eradicate bindweed in permanent fence rows or roadsides there is usually no seedling problem, since the land remains more or less sterile to all plant growth for years.

All areas on uncultivated land from which bindweed has been eradicated by chemical treatment should be closely inspected several times each season and any seedling plants found given a light application of sodium chlorate. Inspection of such areas should be continued until no bindweed plants are found for two seasons.

The necessity for being constantly on guard against reinfestation from seedlings on land that has once been infested with

bindweed emphasizes the importance of farmers and other landowners being on guard against bringing bindweed seed on their land in livestock feeds, crop seed, garden or flower seed, balled evergreen trees or fill-in dirt from infested land.

How a Champion Grows Tomatoes

Condensed from New Jersey Farm and Garden

William A. Haffert, Jr.

WHEN a grower sets an all-time high season grade in the Ten-Ton Tomato Club the first time he ever grew canhouse tomatoes, then beats his own record for quality the following year and also garners second prize for yield, he isn't pitching dice!

But if you were to ask lean, hard-working Edward Noller, the 1941 first prize winner for quality and second prize winner for yield, what he does, he pushes back his cap and remarks: "Well, I guess every grower varies practices to suit his equipment, but we pretty generally follow recommended practices. And naturally we pin a lot of faith in the weather."

Made Remarkable Record

Before we examine the "recommended" practices used on the Noller farm, which is located about ten miles southwest of Freehold, New Jersey, let's take a look at the remarkable record its operators chalked up:

Noller raised 10 6/10 acres of tomatoes in 1941 and averaged 19 7/10 tons to the acre. They received a season grade of ninety-three per cent in U. S. No. 1, six per cent in U. S. No. 2, and one per cent in culls—an all-time high in the Ten-Ton Club. In 1940, Ed received a season grade for 9.3 acres of eighty-seven per cent in No. 1, twelve per cent in No. 2, and one per cent in culls, which set a record for quality up to that time.

Half of the canhouse tomatoes produced under contract in 1941 were grown in the same field that was used in 1940. The soil in this field, which was planted in cabbage and parsnips in 1939, tested in 1940 to a pH of 5.75 and on the other, which was new ground, a pH of 5.81. (The pH was slightly higher in the 1941 test.) The

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fields are well drained and do not have a tendency to wash or surface erode.

In April of 1941, the Nollers broadcast 1,000 pounds to the acre of hydrated lime over a rye cover crop, added seven and one-half tons per acre of horse manure, and plowed it under. (In 1940, they used a ton to the acre of lime.) After the field had been disked and a fine plant bed established, 1,000 pounds of a 4-8-10 commercial fertilizer was broadcast and harrowed into the surface ground.

The rows were then made sixty inches apart and well grown Marglobe plants from Georgia were planted, spaced thirty-four inches apart in the row. The rows were set two at a time, thirty-four inches by five feet. In planting, a starter solution was used in the transplanter to give the plants a good early growth. Water was applied liberally at the same time.

"The plants were set about May 1 to 10," Ed explained, "and four weeks later we side-dressed and applied a complete 5-10-10 fertilizer, 500 pounds to the acre, using a riding cultivator to make the application. We made another application four weeks later, using hand drills and using about 250 pounds of 5-10-10. We cultivated six or seven times to control weeds.

"Most of the time we cultivated with a two-row tractor the three-foot way, and used a one-row tractor the five-foot way. We used the riding team cultivator once or twice, and made the final cultivation with a one-row tractor."

The crop was sprayed three times with arsenate and lime, once a few days after planting for flea beetle, and twice more for green worms.

The Nollers delivered their first load of tomatoes to the canhouse August 4, and the last load on September 19. The good weather provided an unusually long picking season.

They hired about ten extra pickers, six of them high school boys who were carefully coached before they began. All the picking was under personal supervision, and Ed says this is one of the big reasons the quality was so high. They made nearly one continuous picking.

This is the second year that the Nollers contracted to grow canhouse tomatoes, and they find that under their set-up this crop fits well with the rotations and also with the help in picking.

The Bureau of Entomology and Plant Quarantine

P. N. Annand

Chief, Bureau of Entomology and Plant Quarantine
U. S. Department of Agriculture

THE Bureau of Entomology and Plant Quarantine is a "defense agency" in peace and war. Its activities are directly related to the program of all-out defense of our country. Men in camps and military stations must be protected against insects, not only the kinds that bite, that destroy foods and fabrics, but also the ones that spread disease. The housefly alone carries thirty different kinds of disease. Mosquitoes carry yellow fever, malaria, dengue, filariasis, and sleeping sickness to horses and man. North American ticks carry the virus of Rocky Mountain spotted fever.

Before an insect can be combated effectively it must be correctly identified and its life-history and habits understood. It is not enough to know that mosquitoes are present in certain areas; the species must be identified to determine whether or not it is a disease carrier, and where it breeds, before control measures can be applied. Specialists say much of the hazard of insect-borne diseases can be prevented by careful selection of camp and cantonment locations and by consistent use of preventive measures.

Screwworms, cattle grub, horse bots, and sheep and poultry pests take a great toll from domestic animals, as they lower the vitality of the animals they attack and impair the value of their products, such as meat, leather, wool, and other materials vitally essential to National Defense. Great quantities of stored foods, flour, cereals, cured meats, dried fruits, and cheese, must be protected from maggots, mites, moths, and beetles; woolen goods, blankets, and uniforms must be safeguarded from destructive moths and beetles. Warehouses and store rooms must be capable of easy fumigation, defense agencies must know where dependable insecticides can be had, and practical devices for applying them, to protect soldiers and civilian employees. They must know how supplies of lumber, tools, imple-

ment handles, unfinished gun stocks, and airplane propellers can be protected from insect damage; how buildings can be made termite-proof. In these problems the Bureau is assisting by making available the results of years of research by its specialists to safeguard the structure of our National Defense from insect enemies that might otherwise serve as effective "fifth columnists." Research now in progress is being directed to furnish the answer to problems peculiar to the present emergency and for which satisfactory solutions are not available.

In combating insect pests and plant diseases the Bureau has three distinct lines of work. The first is the research on insects, their economic relations, and their control; the second, actual control or eradication of serious outbreaks or incipient infestations of insects and plant diseases; and the third, enforcement of quarantine and restrictive orders designed to protect agriculture from insects and plant diseases. The Bureau now has a personnel of 3,290 employees, of which approximately 1,043 are trained specialists.

Research Work of the Bureau

Research work of the Bureau includes the study of insects injurious to crops and crop products, fruits, and forests and forest products, insects that affect the health of man and livestock, that infest human habitations, or are injurious to industries. Studies are made on classification, anatomy, physiology habits, and responses of insects under normal and artificial conditions, to determine the effectiveness of control measures and to learn which stages in the insect's life-history are most vulnerable. The research also includes study of insects that may be beneficial—those forming the basis of industry, as the honeybee, and those that prey on other insects, thus aiding in the control of harmful species.

Investigations are conducted both independently and in cooperation with other branches of the Federal Government, with State, county, and municipal agencies, with agricultural and other organizations, and with individuals. Experimental phases of the work are carried on largely at field stations or laboratories in strategic locations throughout the United States. The Bureau has at present 146 laboratories and sublaboratories, including those at the Agricultural Research Center at Beltsville, Md.

Under the immediate emergency the demand for certain vegetable products by our allies has focused attention on the pea aphid and pea weevil, potato tuber moth which attacks also tomatoes, tomato horn worms,

the corn ear worm, the Mexican bean beetle, and the sugar-beet leafhopper, which transmits a very destructive disease of sugar beets known as curly-top. Tobacco insects, such as the cigarette beetle and tobacco moth, are of greater importance at the present time than heretofore, because they attack the tobacco in storage, which has greatly increased because of export conditions.

Among the major activities of the Bureau is research on the control of grasshoppers, European corn borer, and the hessian fly. Besides laboratory and field studies of insects affecting cereal and forage crops, experiments leading to control by cultural practices, the use of machinery, and other methods are under way. In the West grasshoppers and Mormon crickets cause widespread destruction. The Bureau has devised changes in the poisoned-bran bait for grasshoppers, which has reduced its cost and increased the scope of large-scale control campaigns. A new bait, which is highly effective, has been devised for the Mormon cricket.

In the South the Bureau has conducted extensive investigations on cotton pests, the control of which would mean increased profits for growers, through increased yield, improvement in quality, and reduced cost of production of cotton. These investigations are being conducted in co-operation with State agencies. Important insects studied include the cotton boll weevil, pink bollworm, cotton flea hopper, and thrips. Experiments have proved the effectiveness of cultural practices and the use of calcium arsenate in boll weevil control, and that the cotton flea hopper, tarnished plant bug, and other sucking bugs may be controlled by dusting with mixtures of sulfur and arsenical poisons. Cultural practices for the control of the pink bollworm have been developed.

The codling moth, pear thrips, oriental fruit moth, plum curculio, grape berry moth, California red scale, and citrus pests cause great economic losses to the fruit industries. The Bureau is doing research work on these pests and on insects attacking dried fruits, especially the raisin moth and the dried-fruit beetle, to prevent infestation in orchards so that the fruit may reach the warehouses free from infestation. Investigations of Japanese and Asiatic beetles are intended to help the individual home owner or grower protect his property from injury by these pests. The Bureau is developing control methods that will permit transportation of agricultural products without danger of long-distance spread of infestation to new localities.

Research work on fruitflies is being carried on in Mexico, Ha-

waii, Puerto Rico, and the Canal Zone, co-operating with the experiment stations in Hawaii and Puerto Rico and with the Mexican Department of Agriculture. Biological and control investigations are supplemented by the development of processes for the sterilization of products to permit movement in the channels of trade.

The native insects injurious to forest and shade trees which are being studied are bark beetles, defoliators, forest-nursery insects, and termites. Much attention has been given to the tree-killing *Dendroctonus* beetles which have destroyed large areas of valuable pine timber in the West and in the Southwest. A method was recently developed for injecting chemicals into trees killed by bark beetles to poison the beetle broods, and for treating freshly cut posts and poles to prevent subsequent insect attack. Under investigation are such pests as the gypsy moth, satin moth, European pine shoot moth, and European spruce sawfly, and the possibilities of their control by artificial, silvicultural, or natural means, which involves the establishment and colonization of natural insect enemies from foreign countries. The role of insects in transmitting tree diseases is a recent line of investigation, in co-operation with forest pathologists. Two elm bark beetles are found to be the principal vectors of the Dutch elm disease, which threatens to destroy one of our finest native trees, the American elm. The Bureau gives technical direction to large insect-control camps being conducted by Federal and State agencies and private owners on timberlands.

Such pests as mosquitoes, sand flies, ticks, lice, and eye gnats, affecting man, and screwworms, cattle grubs, horn flies, bots, and lice affecting animals, are studied. Investigations on the beneficial use of blowfly maggots in medicine have resulted in the discovery that two chemicals, allantoin and urea, which are present in the secretions of blowfly maggots, are largely responsible for the healing of wounds. These chemicals are now produced synthetically and have been widely adopted by the medical profession. Under investigation are fabric-eating pests, as clothes moths and carpet beetles, also ants, cockroaches, cheese skippers and other insects that damage packaged goods; insects that damage hides and skins, and those that damage books. In its work on animal parasites the Bureau co-operates with the Bureau of Animal Industry, the Food and Drug Administration of the Federal Security Agency, State agricultural experiment stations, and individual livestock owners in such investigations as determinations

of insect vectors of disease, methods of treating animals for parasite control, and the practical application of control methods. In studies of insects affecting man and animals the Bureau works in co-operation with other departmental agencies, Government hospitals, and leading surgeons. In studies of insects attacking fabrics, foods, books, hides, and skins it has benefited by co-operation with the Army and Navy Quartermasters, St. Elizabeth's Hospital, the Archives, the Federal Trade Commission, and other Governmental agencies, numerous commercial concerns, and libraries. In mosquito-control studies as related to wildlife conservation and rodent-host destruction it has co-operated with the Fish and Wildlife Service, Interior Department.

Studies of Beneficial Insects

The honeybee ranks first among the beneficial insects, as the source of wax, honey, package-bee, and queen-rearing industries, and for its usefulness in the pollination of fruit, vegetable, and forage crops. Headquarters for bee studies are at Beltsville, Md., and regional investigations are carried out at field laboratories. These studies include the biology of the bee, its responses to natural and artificial conditions, problems in apiary management, the care of honey, and the development of disease-resistant strains. Other activities include a bee-disease diagnosis service.

Investigations of diseases and natural enemies of insects are made to determine ways of utilizing those which aid in controlling pests, especially those of foreign origin which left behind them in their homeland the parasites and predators that held them in check there. The Bureau has made extensive surveys in foreign countries, studies to determine the status of parasites and predators found and, finally, large-scale field collections or rearings for shipment. After importing the material the Bureau distributes it to various laboratories for further rearing and colonization. Studies are made to determine whether the populations of these beneficial insects are affected by chemicals and other control methods in use for pests. The biological control work of the various divisions is correlated and is carried on in co-operation with State agencies.

Chemical investigations to develop new insecticides and fungicides and to improve methods of their manufacture are made in the Bureau, and new compounds and combinations of compounds more effective, cheaper, less hazardous to operators, and safer to apply to fruits and vegetables are constantly being developed. Each year thousands of compounds or preparations are tested to deter-

mine their insecticidal value. Special attention is given to development of substitutes for the objectionable arsenicals now used for controlling pests on foodstuffs. Research is conducted to discover better fungicides than those now in use. The Bureau works for the improvement of the insecticides in use by the farmer, orchardist, truck grower, as well as those used in the household and on pets and domestic animals, and studies their physical and chemical properties, aiming at freer application and cheaper manufacture. Wetting agents, emulsifiers, adhesives, and diluents used with insecticides and fungicides are studied. The Bureau also concerns itself with methods for removing harmful residues from fruits and vegetables that have been treated with insecticides.

In order to understand the action of toxic substances on insects, the physiology of the insects is studied. Equipment for the application of insecticides—liquid, gaseous, and solid—is devised and tested and improvements made wherever possible.

Control Work

The Bureau carries on projects to eradicate or prevent the spread or reduce the rate of spread of newly introduced insects and those of limited distribution, such as the Japanese beetle, the gypsy and brown-tail moths, the pink bollworm, the Mexican fruitfly, and such diseases as the Dutch elm disease, the black stem rust of wheat, the phony peach disease, the peach mosaic disease, the white pine blister rust, and the citrus canker.

Under legislation enacted in 1937, the Bureau co-operates with State and local groups in the control of incipient and emergency outbreaks of insect pests and plant diseases. Notable among such campaigns are those for grasshoppers, Mormon crickets, and chinch bug. In these operations the Bureau is assisted materially by State, county, and local agencies and by individual farmers. Grasshopper egg surveys made the preceding fall are used for determining the amount of bait required. The effectiveness of the grasshopper control campaign in 1940 was shown in crop savings estimated at $52 worth of crops for each dollar spent on control. The chinch bug outbreak in 1940 necessitated the purchase of nearly 2½ million gallons of creosote, which was consigned to 167 counties in the Central States for use in erecting and maintaining barriers for the protection of corn.

Quarantine Work of the Bureau

Prior to the passage of the Plant Quarantine Act in 1912, which prohibits or regulates the entry of foreign plants and plant products, we had no control over invasions by foreign pests, such

as the European corn borer, the Japanese beetle, the German cockroach, or the less important Italian pear scale. Under the Plant Quarantine Act, 20 quarantines and restrictive orders are now enforced. The act provides for the entry under permit of certain plants, cereals, fruits, vegetables, cotton, and other products believed to carry a negligible pest risk, at designated ports of entry, subject to inspection, and if necessary, to disinfection.

The Insect Pest Act of 1905, prohibiting the importation or interstate transportation of insect pests and the use of the United States mails for that purpose, is enforced by plant-quarantine inspectors at various ports of entry, who also, in co-operation with the Treasury and Post Office Departments, inspect ships, airplanes, passengers' baggage, crews' quarters, ships' stores, and foreign parcel-post packages for the presence of prohibited plant material which might be the means of introducing injurious plant pests.

The Mexican Border Act was passed in 1918, following the discovery of the pink bollworm of cotton in the Laguna district of Mexico, to prevent the entry of this pest into our cotton-growing States in materials from Mexico. All freight cars are inspected in the Mexican freight yards opposite the American port of entry and are fumigated when necessary. The Bureau also enforces quarantines and regulations governing the entry of plants, fruits, vegetables, cottonseed products, and other articles from Mexico. Plant-quarantine inspectors are stationed at all the more important ports of entry on the Mexican border.

The Bureau also administers an act to regulate importation of the adult honeybee, to prevent the introduction of dangerous bee diseases.

"Mystery" Fiber Now Produced in Florida

Condensed from Florida Grower

Bert Livingston

A 3000 year old mystery is about to be solved. With its solution Florida logically should become world capital of the greatest textile advance since mechanical conversion of animal and vegetable fibers into cloth.

Upon thousands of Everglades acres historically considered worthless will be grown tons of the most interesting textile fiber known to man. For the first time industry will be enabled to produce, in quantities limited only by time required for agricultural production of raw material, superior fabrics and papers known even thousands of years ago to excel all others.

It is a fascinating story, the story of Ramie, oriental fiber that produces "cloth everlasting," royal linen of Egyptian pharaohs and Chinese emperors that survives their death in the dawn of history and may be seen well preserved even today. This fiber has a tensile strength eight times that of cotton, three times that of linen, and seven and one-half times the strength of silk. Known even to such ancients as Vergil and Marco Polo is the fact that Ramie does not stretch. And its apparent imperviousness to rot or even mildew made it admirable for use for hundreds of years in sails on Chinese vessels that are said to have outlived their makers. Science has determined further that Ramie is twice as resistant to heat as cotton. And while unaffected by oils or grease, it accepts dyes more readily than cotton, even when mixed with animal fibers.

The Florida Everglades are admirably adapted by nature to large-scale, economical production of Ramie. Actual production figures of experimenters were presented to show that advanced methods of modern agriculture can be expected to produce yields not only far in excess of oriental Ramie plantings but also fully adequate to maintain mass production operations.

Throughout the centuries advancing textile science was baffled in attempts to provide mechanical means of separating commercial quantities of Ramie from the resinous gums that bind it more closely to the parent plant

Reprinted by permission from the Florida Grower, Tampa, Florida, Dec., 1941

than the apron strings of an anxious mother. Modern engineers fared no better in seeking to replace arduous, tiring, hand labor and man-powered, oriental contraptions that have remained practically the same for hundreds of years. And the result was the same, non-uniform fiber, with 80 per cent of the product destroyed or damaged in process of recovery and purification. Neither volume, speed, quality, nor cost could be reconciled to modern factory production methods necessary in commercial textile application.

So Ramie has remained for most part the limited product of oriental countries, where centuries are more significant than years and man's labor or even life are of no consequence. Dowery chests of Chinese brides have continued to hold Ramie fabrics unexcelled for beauty, ranging from soft sheen of rare silks to heavy stateliness of finest linen. They had been months, even years, in the making; they will be just as strong and beautiful for the marriage chest of their daughters as they were when they accompanied their mother or even grandmother to her bridal home. But into the world of commerce came only an unreliable dribble of Ramie fabrics, highly priced and eagerly sought for their superiorities. Best known of these are beautiful China-grass linens, cherished by modern housewives not only for their scarcity but for their durability.

Today, near the south shore of Lake Okeechobee, machines are in operation that for the first time in history harvest Ramie with mechanical ease, speed, and volume comparable to harvest of wheat. Other machines produce commercially acceptable decortication. Final processes are yielding the strongest, purest, most beautiful Ramie fiber ever known—with no loss of raw material and an increasing yield of by-products that in themselves will be worth millions. Furthermore, these machines have been accomplishing satisfactory mass production for an extended period.

Florida's first commercially produced and decorticated Ramie fiber was delivered to a leading manufacturer of finest quality American paper more than a year ago. Without fanfare an initial contract for 18,000 pounds of Florida Ramie fiber was completed. From this fiber was produced paper indistinguishable, even by experts, from the finest paper known — French cigarette paper produced from linen rags. Leading consulting engineers in paper production have completed a survey showing that production of fine Florida Ramie paper can be standardized and continued in any desired volume at one-half the cost of comparable French

paper. This paper manufacturer is urging acceptance of contracts increasing as rapidly as possible to as much as 24 tons per day. Another manufacturer, of paper for the world's most exacting purposes, has produced entirely satisfactory paper from Florida Ramie fiber and is offering tentative contracts for the progressive amount of 10 tons per day on a reliable supply. There are salient facts to producers and consumers of more than $2,060,849,000 worth of paper and allied products in the United States annually. The significance is greater in the face of world shortages and national priorities. Yet this is the least valuable of uses for Florida Ramie fiber.

Latest and apparently most practical advancement in wresting from nature the age-old secret that makes all this possible was not the work, as would be expected, of a learned scientist nor a famous engineer. Generous application of pep, push, and perseverance are major ingredients of the formula by which a Miami business man attacked the problem. E. B. Elliott has been known best as president of an outdoor advertising concern with international operations. Henceforth his fame probably will be greater as the man who gave Ramie fiber to modern industry. But perhaps strangest point of the story, to those familiar with the history of development in Florida, there is no stock or financing plan for sale after fifteen years of experiment and study.

Millions of Florida motorists who for the past ten years have read advertising for scores of products, presented on Elliott billboards along the highways, never realized that they were looking also at the most unusual testing ground ever devised for a Florida agricultural product. Behind these billboards were carefully watched test plantings of Ramie. Their purpose was practical determination of where Florida Ramie will do best under natural conditions, without artificial assistance. In every instance the road to easiest and most abundant production pointed back to the Florida Everglades. More surprising, its thousands of acres of lands always considered worthless, were found to be more productive than the expensive "custard apple" lands, along the lakeshore, so valuable to Florida vegetable farming.

For the last five years, on twenty-five acres of the less productive type of land, Mr. Elliot proved the methods and results of Florida Ramie production. Of the known varieties all are being discarded but two that proved superior to all others heretofore grown in this country. These produced the longest, straightest

fiber stalks and heaviest yields. He proved that Ramie can be ready for harvest 90 days after planting, that four harvests can be made annually, that yields of 2,000 pounds per acre anually can be increased to 3,000 pounds of stalk and fiber as the crop grows older.

Practical growing established the fact that Ramie once planted is a perpetual crop producer, at a reasonably low cost. A fertilization program of 350 pounds per acre of a formula selling at $28 per ton proved and continues adequate. No insect or disease pests have been discovered. And complete water control to guarantee Ramie freedom from wet feet, the only condition it fails to survive, seems a major necessity. This is accomplished easily and economically in the Everglades.

Agricultural engineers employed by Mr. Elliot agree that with plants for processing established, Ramie planters increasing proportionate to industrial expansion can be guaranteed an annual net profit of $20 to $35 per acre over and above all costs of investment, production, and harvesting. This, multiplied by the thousands of suitable and idle acres available, would mean a tremendous increase of Florida agricultural income and employment. Yet Mr. Elliott urges that no one even consider Ramie planting until the processing plants are sufficiently expanded to take care of production—at profits mentioned—and not before planters can arrange with responsible people to buy their crop.

As Ramie production was proved, harvesting and fiber separating machinery became essential. Mr. Elliott reasoned: "If hands are too expensive, do away with hands. Find something that will do the job as much like hands as possible but do it more quickly and more economically." This straight-forward deduction is key to the riddle. Production of perfect Ramie fiber by speedy mechanical means is accomplished as a series of associated steps (just as Chinese coolies and Egyptian slaves accomplished the job for centuries), rather than as a single operation. The three machines are either patentable improvements of existing machinery or outright invention for accomplishing specialized functions. Both machines and processes for purifying Ramie fibers and degumming them are protected by patents. American industry can control and safeguard Ramie production in world commerce.

Initial harvesting operations combines removal of leaves and cutting. De-leafing reduces bulk and prevents deterioration of Ramie fibers enroute to process-

ing. Preliminary decortication removes part of the bark and woody constituents. Partial dehydration is followed by completed decortication and emergence of raw Ramie fiber—stronger, more durable, and more suitable for rope, cord, and heavy twine manufacture than any known commercial fiber. Today its market value is unlimited at satisfactory prices depending on quality of fibers.

Here begins a fascinating industrial story, as raw Ramie fiber is ready for baling and movement to storage or refining plant. Sufficient fact about the decortication machinery is mechanical duplication of the flexible, wringing, twisting, scraping movements by which hand labor achieved fiber separation.

Shives, or by-product, of decortication present multiple possibilities. Finely ground they produce a superior wood flour desirable as an unusually strong filler for plastics readily applicable to a number of major industries. Such flour that can be produced at a cost of $7 per ton today has a delivered value of $32 per ton. Through process of industrial "digestion" shives yield Lignin powder essential to production of dark plastics with tremendous strength and versatility. Vanillin, or imitation Vanilla, glucose, and methyl or industrial alcohol also are yielded. Superior plastics, from building tile to ornamental novelties, have been made from Florida Ramie shives. Excellent paper pulp of printing grade has been produced from "cooking" the "waste" product. Paper pulp that can be made for $18 per ton, plus cost of raw material, has a current market value of $60 per ton. And one of the world's largest rayon manufacturers wants to contract for the entire output of raw materials for production of rayon superior for, among other qualities, elimination of stretching.

Solutions or "liquors" in which degumming and final refining of fiber is accomplished also contain valuable by-products. From them, in conditioning the solutions for re-use, is recovered quantities of commercial chlorophyll, tannic acid, and pectose from which high-grade pectin can be derived in quantities estimated up to 400 pounds per acre of harvested Ramie. Pectin is worth from 35 cents to $1.00 per pound, according to grade.

Greatest value of Ramie lies, naturally, in its refined fiber. Its destiny is three-fold—textile fabrics, fine paper, or purest cellulose. Plastics from this cellulose, with a remarkable tensile strength said to be ten times that of steel, are "readily adaptable to anything from *armour plate* and airplane or automobile bodies to delicate art objects." They can be

produced ranging from crystal clarity to any desired color or pastel shade.

The textile industry eagerly awaits production of a steady, reliable domestic Ramie supply. Upon present spinning and weaving machinery used for any textile, Ramie can be used alone or in mixture with other textile fibers. The marvelous qualities and superiorities for which Ramie cloth has been sought throughout the centuries can be imparted to bettering modern textiles and at an ultimate reduction of cost to consumers. Mill operators already have made in their plants wonderful fabrics ranging from heavy tapestries and upholstery materials to knitting wools, finest worsteds, and sheerest "linens." Ramie fabrics have been identified repeatedly as the finest woolens by canny Scottish woolen buyers who pride themselves for unerring sense of judgment based on touch and years of experience. This is why textile mills feel that as much as 50 cents per pound for Ramie fiber is a good bargain.

Even our government is vitally interested in Florida Ramie fabrics that are stronger than the vanishing supply of linen. It can be produced at less than half linen cost, be used in parachute chords and harnesses three times as strong as linen, and is absolutely free from weakening caused by mildew and stretching.

This story explains why the state recently sold E. B. Elliott 2,500 acres of Everglades land, of which 500 to 700 acres is being planted with 10,000,000 Ramie roots which Mr. Elliott says are ready for planting from his original plantation. This is why the soon-to-be-chartered Cellulose Fiber company has an initial investment of $450,000 in scaling up Ramie fiber projects and machinery that today produces 25 tons of commercially satisfactory Ramie fiber annually to refining plant, machinery, and equipment that by 1942 is expected to be capable of turning out five tons of equally satisfactory fiber daily, or 1500 tons per year.

Tillage and Crop Residue Management

Condensed from Soil Conservation

L. S. Carter

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FOR many years the prevailing tillage and crop residue management practices for the grain-growing lands of the Great Plains, the Western intermountain areas, and the Pacific Coast have consisted of covering all crop residues as completely as possible during initial tillage operations, and then cultivating intensively for weed control and the developing of a seed-bed. Where a summer fallow system was followed, the stubble and straw, and other organic materials, were considered liabilities rather than assets in that they interfered with development of the loose, well-pulverized soil condition desired during the fallow period and for seeding operations. In many instances farmers believe that a seedbed of clean, well-pulverized soil was essential for seeding and a satisfactory stand of grain, and for this reason they burned or otherwise destroyed crop residues to prevent their interfering with tillage operations.

This type of crop residue management, along with the intensive tillage practiced in the principal grain-growing areas of the West, has greatly depleted the soils of their ability to absorb water during periods of relatively high rainfall, to retard run-off, and to resist the forces of wind and water erosion. Intensive or excessive tillage produces a single-grain or pulverized structural condition of the surface soil. Such a condition tends to reduce or retard the rate and extent of water intake—soils become compacted or puddled during rainfall periods and hard or crusty when dry, so that the amount of surface run-off is increased and the final result is erosion by water. Furthermore, a finely divided or single-grain structural arrangement of soil particles facilitates the pick-up and transportation of soil material by wind, with the result that serious soil loss from cultivated land is suffered in areas having wind erosion problems.

Experiments and experiences of farmers during the past few

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years have brought to light the tremendous value of a rough, trashy soil surface condition for protection of the land against wind and water erosion. It has been found that a rough, cloddy surface, covered with straw or other organic materials, absorbs water at a much greater rate than a smooth well-pulverized surface. By this means run-off is retarded, moisture evaporation is reduced and the soil is protected against blowing.

During recent months numerous efforts of farmers, manufacturers, and others have been directed toward the development or adaptation of tillage implements and methods that will provide the desired mulching of soil surface under grain-farming conditions. In general, most of these efforts have been aimed at modification of existing equipment and the refinement of tillage implements. Some special types have been developed to meet particular conditions encountered in handling large quantities of residues, or to demonstrate fundamental principles before recommendations are made for general use. The development and use of straw spreaders for combines has increased tremendously since it was found that large quantities of straw, if properly spread, can be handled as mulch if stubble mulching implements are used in the tillage operations.

The condition of the land following initial tillage operations and during the fallow period will vary in different parts of the country, depending on the desired condition. In some sections a smooth surface, with all or most of the residues remaining on the surface and stubble in an upright position, is desired. Under other conditions a rough stubble mulch is believed to give the greatest protection against wind and water erosion. In the Pacific Northwest it has been found that a rough cloddy condition of the surface gives considerable protection, and in the development of tillage practices efforts are directed toward producing such a condition. Modifications of tillage implements are being made, to produce clods and bring them to the surface while all residues are left on top. It is believed that in the Great Plains and particularly where wind erosion is a problem, a smooth surface with most of the stubble in an upright position will tend to reduce the blow hazard and also will facilitate collection and holding of snow. On sloping lands all these operations, whether designed to produce a smooth surface or a rough cloddy one, should be conducted on or as near the contour as is possible. Thus, in any attempts to modify existing equipment or develop new implements for tillage and residue management, the desired

condition of the surface soil following tillage operations should be borne in mind.

In developing a stubble mulch system of grain farming through the use of crop residues and tillage, consideration must be given to the cropping system followed, the amount of residues available for mulching purposes, and the types of tillage implements being used by the farmer. Where a system of cropping and summer fallowing is practiced, the time of starting the tillage operations, and the number of operations required to destroy weeds and to condition the land for seeding, will vary from those employed under an annual cropping system. The amount of crop residues available for stubble mulching will depend on the methods used in harvesting the grain crop, the time of starting the initial tillage —whether fall or spring—and the amount of rainfall. The type of equipment being used by farmers will influence the number of operations required. Thus, since the farmers are familiar with them, initial attempts to inaugurate a stubble-mulching system of tillage should deal with modifications or improvement of these implements.

The ordinary moldboard plow may be converted to a very satisfactory stubble mulch tillage implement by removing the moldboard. Elimination of the moldboard results in an implement which lifts and breaks the soil instead of turning it over. Not only is most of the crop residue left on the surface by a moldboardless plow but, if the soil is dry, clods are formed and brought to the surface so that a rough stubble-mulched condition is produced. For plows of the quickly detachable share type, a narrow strap of steel is required in place of the moldboard as a support for the share and to protect that portion of the soft metal frog to which the moldboard was attached. Since this metal strap gives some turning capacity, the roughness of the plowed land and the amount of residues left on the surface can be controlled to some extent by its width when it is used to replace the moldboard. Removal of part of the moldboard will have a very similar effect on the operation of the plow.

Of considerable interest to farmers is the reduction in power required to pull a moldboardless or a modified moldboard plow, compared to that of the conventional type. Dynamometer tests have shown this reduction to be from one-fourth to one-third that of the ordinary plow. This reduction in power, converted into cost of tillage operations, may be quite significant where large acreages are plowed and large power units are used.

A weeding operation should follow the initial tillage with a moldboardles plow, to keep down soil moisture losses through transpiration by weeds, to firm the seedbed under the mulch, to establish a subsurface moisture zone and to condition the mulched surface for absorption of water during the next rainy period. The ordinary rod weeder is one of the most effective and inexpensively operated weeders for working summer fallow land, after modified moldboard plowing. This implement, operating below the surface, severs weed roots, compacts the lower portion of the plowed zone, works clods and trash to the surface and mellows the seedbed. Land that has had a sufficient number of rod weedings to meet the purpose of weeding, seldom requires any further preparation for seeding.

Seeding of grain on stubble mulched land may require some care on the part of the operator in getting the seed placed below the rough, mulched surface. It is most important that the grain be placed in the finely tilled, compacted, moist, subsurface soil zone to secure proper germination and stand. While the deep-furrow and the ordinary disk type of drill is most effective for drilling grain through a stubble mulch, almost any drill can be used if the mulch is relatively light. For extra heavy mulches or a very rough, cloddy condition, some modification of the ordinary drill, or the use of a deep-furrow type, is necessary to do a good job of seeding. Numerous studies and observations have shown that satisfactory stands of grain can be obtained on seedbeds with a much rougher, mulched condition than was thought possible a few years back. Care should be taken to leave the surface in an undisturbed condition as much as possible during drilling, so that the young grain seedling will have some protection while becoming established. The clods and mulch on the surface after drilling are of great value in slowing down run-off while the grain is becoming established.

One of the most extensively used implements for initial tillage of stubble land, particularly in the relatively low rainfall area, is the one-way disk. This widely distributed machine is known by various trade names such as the disk tiller, wheatland plow, one-way, etc. The amount of mulch left on the surface during one-way disking is determined by the quantity of straw and stubble on the land, the size and curvature of the disks, the dryness of the soil, and the speed of operation. High speeds and moist soil result in extensive coverage of crop residues and unnecessary pulverization of the surface layer. One-

way disking of heavy textured, dry soils, produces the very rough, cloddy condition which is the desired goal of initial tillage for some areas. Fall disking of extra heavy stubble, to promote some decomposition of the residues and prepare the land for summer fallow tillage, is done quite extensively in the higher rainfall area of the Pacific Northwest. For moderate to light quantities of residues, spring disking is preferred over fall disking, since these light residues offer more erosion protection during winter in an upright undisked position. Fall disking is objectionable because the stubble decays and the quantity of mulching material for protection of the fallow land is reduced.

A number of straight-blade tillers or cultivators have been developed for use in grain stubble, particularly in those areas where wind erosion is a serious problem. These blades operate under the surface, sever weed roots, loosen the soil to a depth of 3 to 6 inches and leave the stubble in an upright position. The operation of a straight blade leaves a smooth surface, so desirable under some conditions, with all residues on the surface for mulching purposes. The depth of cutting can be regulated to meet the need according to different soil, climatic, and weed conditions. One example of the straight - blade type of cultivators, known as the Noble blade, was developed by a farmer and used very extensively on his farms in western Canada. This and other similar blades have been used without other implements for tillage of stubble and for the control of morning-glory. In those areas where a rough, cloddy surface condition is desired, the Noble blade is not as satisfactory as some of the other subsurface tillage implements. Trials with this and other types of straight-blade implements are now under way in all principal grain-growing areas of the West.

The widely used duckfoot cultivator lends itself to certain modifications that provide very satisfactory stubble mulch tillage. By making the duckfoot shovels larger and longer, tillage can be accomplished with a minimum of surface disturbance, but the blades must be operated parallel to the surface to prevent a furrowing effect. If the frames are built higher and the standards placed farther apart, and if wide blades or sweeps are attached in place of the duckfoot shovels, an ordinary cultivator can be made that will operate under a heavy grain and weed stubble. When properly assembled and operated this implement destroys weeds, leaves the stubble in an upright condition for collecting and holding snow, loosens the soil under-

neath, and promotes the development of a mulched surface. Subsequent tillage to destroy new weed growth, firm the seedbed, and keep the surface in a condition for water absorption is most important.

One of the latest and most promising developments along tillage lines is the shovel bar attachment for rod weeders. This tool consists of a heavy bar to which is attached a series of small shovels with the rotating square rod placed between the shovels and the bar. Flanges are provided to attach this assembly to the frame of the weeder and the rotating rod to the drive shaft. This attachment enables the weeder to penetrate relatively hard ground such as is encountered in initial tillage or compacted fallow. The implement is especially adapted to initial tillage of stubble on light-textured soils, and for weeding where summer fallows become compacted by summer showers. By going over stubble immediately after harvest, to kill weeds and loosen the soil, mulching can be accomplished with this implement at a much lower cost than for any other type of subsurface tiller. After the initial tillage to loosen the soil 3 to 5 inches deep, the shovel bar attachment can be removed. An ordinary rod can then be attached for weeding during the remainder of the fallow period.

Good Pasture Management Pays

Condensed from The Shorthorn World

Dr. D. R. Dodd

Associate Agronomist, Ohio Experiment Station

NOT so long ago, on one of my many trips around Ohio to take notes on pastures, I stopped at Dr. F. J. Rigdon's place, in Adams County, to look over the fertilized section of a badly depleted pasture. Dock's old gray horse, blind as a bat, was grazing the plot. I watched the sightless animal graze right up to the limits of the fertilized area, take a nibble of untreated grass, turn around and start back eating the improved grass.

I found, too, that cows have "horse sense" about good pasture. My note on B. D. Robin's farm in Highland County, one of the several hundred farms on which we have conducted pasture improvement demonstrations in the State, reads: "Cows prefer nitrogen-phosphate-potash plots. Their next choices are phosphorus-potash, and phosphorus. The lighter the application, the less they like it."

Livestock can often discover treated areas before the improvement can be seen by the farmer.

My experience and observation in Ohio and elsewhere in the humid regions of the eastern United States convince me that pasture improvement pays. In fact, there is probably nothing on the farm that pays better.

But pastures do not pay unless the twin factors of treatment and management are both employed. Both are equally important. Neither will yield maximum returns without the other.

Poor management defeats proper fertilization. In 1937 we treated two permanent pasture areas at Ohio State University. During that season and part of the next, one of the pastures was mowed and grazed to capacity, but not overgrazed. The other was improperly managed. It was not mowed and grazing was insufficient to keep down the herbage. The good treatment, with poor management, resulted in a tall growth of blue with a good many weeds and no clover. The herbage was woody, unpalatable, and contained only about eight per cent of protein.

Reprinted by permission from The Shorthorn World, Aurora, Illinois, Jan. 25, 1941

Good treatment plus good management on a near-by plot produced a beautiful combination of palatable grass and clover, carrying about twenty-seven per cent protein.

On another experiment conducted in co-operation with the Soil Conservation Experiment Station at Zanesville, Ohio, we provided all that could be desired in lime, seed, and management to one pasture. We purposely left the fertilizer off. Poverty grass, weeds, and bare ground with only a trace of clover and desirable grass came through. The scanty herbage was unpalatable an contained only six per cent protein. Sheep, grazing in this paddock, lined up along the fence, looking hungrily over into the adjoining lot.

This second paddock was of the same soil type, and four years earlier had had the same herbage. It had the same seed, lime, and management as the first patch, but had received in addition 0-14-6 fertilizer. There was a fine combination of palatable grass and clover carrying twenty-seven per cent protein. The livestock on it were productive and in no way interested in the meager fare of the sheep in the adjoining paddock. It is this combination of treatment and management that makes pastures out of our exercise lots, and makes possible the profitable production of milk and meat, especially in low-priced periods.

Despite a too common notion to the contrary all grass that grows is not pasture. The average permanent pasture in Ohio, and probably in all eastern United States, is not good enough to support good quality livestock in profitable production.

There are wide variations in the quality of permanent pastures. The content of the various constituents of herbage that make it good feed varies with the productivity of the soil, the treatment, the management, the age of the plants and the kinds of plants. In the pasture literature may be found analyses of herbage from various types of pasture. Under the most unfavorable conditions a phosphorus content as low as one-tenth of one per cent has been reported. On the other hand, where conditions have been very favorable, we find as high as seven-tenths of one per cent.

In other words, a cow would have to eat seven times as much of the poor pasture as of the good to get the same amount of phosphorus. In like manner, the calcium content may vary from as low as two-tenths per cent up to two per cent. The protein content may range from four or five per cent up to thirty per cent, and the Vitamin A content from a trace to several hundred units per

gram. The cow has a large capacity for roughage, but she cannot hold the amount that would be necessary to supply her needs for these necessary food constituents from roughage from these low-analysis pastures.

A cow can come so near to starving on many of our pastures that she yields no returns, even in the presence of an abundance of poor quality herbage. We are concerned not only with how much herbage is present, but whether its chemical composition, digestibility and palatability are such as to make it usable by the livestock. The cow, the sheep, the steer, the horse, know more about pastures than many farmers do. That possibly is not a reflection on the farmer. He does not eat the pasture. The situation would probably improve rapidly if he did.

The average Ohio pasture produces the equivalent of 15 bushels of corn per acre and this probably is as good as the average for eastern United States. Such p r o d u c t i o n is not profitable either as corn or as pasture. A hopeful sign, however, is the fact that many farmers in this area have come to realize the possibilities of improvement and have increased their pasture yields till at present they are obtaining from these pasture areas feed units equivalent to 40 or 50 or even 75 bushels of corn per acre. Pastures properly treated and managed on adapted pasture land should and do produce as many feed units per acre as crops in the ordinary crop rotations. Yields of 400 to 500 pounds of beef or 4,000 to 5,000 pounds of milk per acre have been obtained. These things are mentioned, not because we feel that all pastures should be improved to this degree, but to call attention to the possibilities of pasture improvement and to emphasize a badly neglected state of affairs on most farms.

From a soil conservation point of view there are many reasons for pasture improvement on the steep rolling and undulating lands of eastern United States. Not only does good pasture prevent erosion, but with proper treatment and management it rapidly builds up the productivity level of the soil. These factors should have consideration but they are not sufficient to get many areas improved unless the person paying the bill can see where, when and how he is going to get this investment back. The important questions with most farmers will probably be: Will pasture improvement increase the returns from my livestock, and if so, how shall I go about it?

Probably the most common type of mismanagement is overgrazing or undergrazing. There

should be a constant effort to keep the pasture and livestock balanced. If there is a shortage of pasture at some time, provision must be made to supply more at that time, or some plan must be found to reduce the livestock load. A good example of the latter is where lambs are kept till the flush of the pasture season has passed and then marketed. Generally it is more advisable to adjust the pasture to the needs of the livestock than to adjust the livestock to the varying production of the average pasture.

In most cases the keenest need is for more and better pasture in the hot, dry weather of July and August and early September. Sometimes this need extends on through September. In such case a special type of pasture such as Sudan grass or alfalfa-grass mixture is demanded. One acre of the latter for every two animal units will in most years be ample to provide the extra pasture needed and make possible the protection of the regular pasture areas. Whether these regular pasture areas be permanent pasture or rotation pastures, they need this protection. Abuse of the rotation pasture at this time is possibly not so serious since this area will generally go in corn the next year. The only difficulty in abuse of the rotation pasture is the reduced growth later in the fall and the poor crop of organic matter to turn under for corn. Good corn follows good sod. Over-grazing results in poor sod and reduced corn yield. In the case of permanent pasture, extreme overgrazing in this hot, dry period may so damage the pasture that several years would be required to bring it back. While mid-summer is a critical period, it is not the only danger period in over-grazing. Over-grazing at any time is costly if long continued.

All food material used in the growth of plants is manufactured in the green portions of the plant. Whenever these are removed, reserves from the roots must be depended upon to supply material for building a new green top structure. If this new top is repeatedly removed, the plant is soon exhausted. It is not so much when the over-grazing occurs as it is how severe the over-grazing is and how long it is continued. Naturally this is most likely to occur when growth is slow as in midsummer and early spring.

It may also be necessary to provide surplus pasture area in early spring. One good plan is to use some wheat, rye or barley for this period. The grazing of such a grain crop is beneficial to the new seeding made in it and probably gives as good returns as if the grain were harvested as such. In fact, where growth is rank, the grain crop may be

grazed for a brief period without reducing the yield of grain. Another possible procedure is to apply nitrogen fertilizer at a rate sufficient to add 40 pounds of nitrogen per acre to a good timothy or bluegrass sod—some time after January 1 and before growth starts. In Ohio this is preferably before March 15. Half as many acres as there are animal units to graze should be treated in this manner. If fall growth of the main pasture area is insufficient, barley or rye or nitrogen-treated grass may also be used as a supplemental pasture at that time. Having made provisions to prevent the necessity of over-grazing, our next problem deals more specifically with the main pasture area.

The mowing machine is a very valuable pasture tool. If the livestock load is not sufficient to keep it down, the mowing machine must be used. The question is frequently raised as to whether mowing does not waste the herbage and even injure the stand. In answer to the first question, it should be kept in mind that manure is organic matter made from pasture and other farm crops. It would still be manure and none the less valuable as such before it was eaten. The mowing of surplus growth and leaving it on the land is therefore equivalent to a light application of manure. It supplies nutrients to promote later growth and provides a mulch to protect the soil from excessive drying out during dry weather.

In answer to the second question as to injury to stand, it may be stated that if mowing is delayed till the grass has reached the hay stage, there will remain very little green herbage down close to the soil. Cutting it in this stage leaves only brown stubble and new growth is possible only at the expense of the roots. Mowing at this late date retards recovery and may injure the stand. It is better to mow too soon than too late.

In 1938 plots of Kentucky bluegrass alone harvested by lawn mower at intervals of two weeks yielded at the rate of 1,245 pounds per acre while on adjoining plots a combination of Kentucky blue grass and Louisiana white clover yielded 5,142 pounds. The white clover was responsible for more than 170 pounds of nitrogen per acre in the harvested herbage. This is the equivalent of more than 850 pounds of sulphate of ammonia. The protein content of the Kentucky bluegrass that grew in association with the white clover was increased by more than 50 per cent over that which grew alone. From these figures may be realized the tremendous value of a management program that will maintain white clover in the pasture. The

content will fluctuate with seasons and weather conditions as well as with treatment and management but a much better clover content can be maintained if some Louisiana white and Ladino white clover seed are added, probably a pound of each per acre.

Reseeding rarely has shown any advantage on permanent pasture areas unless the area has been treated. Where desirable types of plants make up less than 5 per cent of the herbage, reseeding has been worth while. Some 5 to 10 pounds per acre of a mixture of the seed of the most practical pasture plants for the area may be seeded in early spring on honeycombed soil, or slightly later where the soil has been lightly disturbed by drill or harrow. With proper treatment the desirable plants soon thicken to form a desirable stand even though little or no seed has been added.

Plowing and re-establishing is sometimes desirable on areas not subject to erosion, but it is in no wise necessary. A good seed mixture for use where new permanent pasture is being established in most of Ohio consists of four pounds of red clover or five pounds of alfalfa, or a mixture of the two, one pound of Ladino white clover, one pound of Louisiana white clover, 2 pounds of red top (fall or spring), three pounds of timothy in the fall or six pounds in the spring, six pounds of Kentucky bluegrass (fall or spring).

Where lime is needed, it is the first essential, but seldom can it do the trick alone. The kind of fertilizer to use will vary with types of soil and locations. Generally, in Ohio, superphosphate alone or superphosphate and manure have given the best returns per dollar invested. Potash has given some increases but not sufficient to justify its general inclusion in recommended practice. With the development of an intensive pasture program, potash may become more important. It has given larger returns when added to nitrogen and phosphate than when added to phosphate alone. In an intensive program, or where nitrogen is being used, potash as well as phosphate should be included in the basic treatment.

Nitrogen has greatly increased the yields of good grass pastures and advanced the possible date of grazing by ten days or two weeks in the spring, but where the management has been such as to maintain a high clover content, the season's increases resulting from nitrogen have been comparatively small. A rather large accumulation of evidence seems to indicate that the chief place for nitrogen is on a limited area of the best grass pasture to

induce early production or on grass areas where for some reason it has not been possible to maintain a good clover content. The addition of forty pounds of nitrogen, approximately $5.00 worth, in a large number of cooperative farm tests, produced on the average the equivalent of 166 pounds of beef or 1,203 pounds of milk. This would look fairly good, were it not for the fact that a more detailed study indicates that most of this increase could have been obtained through clover resulting from minerals alone and better management. Furthermore, when computed in terms of beef at seven cents per pound, each dollar invested in nitrogen gave only $1.39 return above the cost of treatment, while each dollar invested in phosphate gave a return of $2.67 above cost of treatment. Large supplies of nitrogen are necessary in pasture production but usually it is cheaper to get it from the clover plant than the fertilizer.

Generally speaking, then, greater satisfaction is likely to come from the use of 300 to 600 pounds of phosphate or phosphate and potash, such as 0-20-0 or 0-14-6, plus an application of manure, if available, every three or four years. This fertilizer treatment may be applied any time between September 1 and April 1 when soil conditions will permit. A light cutting of the soil with the drill when putting on the phosphate has some advantage but is not essential. Surface and incorporated applications look about the same in two or three years. The rate should not be less than 300 pounds per acre and 600 pounds is better. The second 300 pounds has given about as much increase as the first 300 pounds.

American farmers have become pasture conscious. They are thinking and talking pastures but they are not yet sufficiently pasture minded to buy the amount of fertilizer they should use on permanent pasture unless it is suggested to them.

Sheep Production Programs

Condensed from The Rural New-Yorker

R. W. Duck

OF the six million head of lambs and yearlings annually on feed, including some older sheep, over one-half of these are in the Corn Belt States. The number reported on feed in the Western States is slightly over two and one-half million head; the remainder, or less than one-half million head, represent our Eastern feeders.

Corn Belt fed lambs represent an increase of approximately five per cent over last year. Most of these are marketed during late winter, while the Western lambs arrive principally during March and April. For the past several years the April sheep and lamb market has averaged the highest in price per hundred.

Until recent years most of Indiana's Spring lamb crop was sold on the Fall markets; this is now true to considerable extent with our Eastern lambs. In a high percentage of such cases the lambs lack finish and weight; they are sold when pasture and stubble are gone, and often when the lambs have not even been holding their own for some little time. In both New York State and Indiana the lamb shows in co-operation with 4-H lamb club members have been a deciding influence in demonstrating the possibilities of properly and profitably fitting lambs before marketing. The Indiana work as reported by Henry Mayo, Extension Animal Husbandman, and F. M. Shankin, 4-H Club Department, Purdue University, brings out the important fact that market topping lambs could be produced to sell in June at four months of age. For the past ten years June prices received by farmers have averaged about twenty per cent more than Fall prices. They found that by providing an abundant supply of green, succulent pasture such as clover, oats, or rape, to supplement permanent pastures during the late Spring and early Summer, it was possible to keep the ewes milking liberally and for a longer period of time, so that the lambs would be fat at weights of 75 to 95 pounds before extremely hot Summer weather arrived. Following this plan the lambs were never weaned but were sold directly off their mothers with little or no grain feeding.

The excellent results mention-

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ed were obtained by providing a good temporary pasture which resulted in low cost production, because it produced maximum milk flow in the ewes. It has been repeatedly demonstrated by investigators that milk flow of the ewe is always the most important single influencing factor in profitable lamb production. Studies by Ritzman and Davenport of the New Hampshire Experiment Station show as much as 79 per cent difference in gains made by lambs while nursing high and low milk producing ewes. It must also be remembered that during the first 120 to 125 days adequately fed lambs should make nearly two-thirds of their first year's gain and growth. Such maximum rapidity of gain possibilities are correlated with efficiency and economy. These together with their comparative low maintenance requirements operate to produce greatest profits with lambs so handled.

Harper at the Indiana Station and other investigators have shown conclusively that for best gains it is desirable to creep-feed lambs prior to turning them on Spring pasture. A slatted opening which permits the lambs free access to best quality hay and grain can be easily provided. It is important that the hay be of best quality, and that the grain be clean and fed in such manner the lambs do not soil it. Clean fresh water at all times; a mineral mixture to the extent of five per cent may be added, and also be kept available for both lambs and ewes. Equal parts iodized stock salt, ground limestone and steamed bone meal make a good mineral mixture. Several sheepmen report to me that they have found the following feed mixture very desirable for creep feeding lambs: cracked corn 50 lbs., whole oats 150 lbs., wheat bran 50 lbs., soy bean or linseed meal 25 lbs.

At the Indiana market lamb show the lambs are graded before placing, and marked with colors to indicate their grade. On the day following the judging the carcasses of the lambs are made available for inspection. Under the stimulus of these good lambs Indianapolis has become one of the best lamb markets in the United States.

Regardless of the livestock production plan followed it will be successful in direct proportion to desirability of the breeding program being used. By using good registered rams of the breed most suitable for given conditions, farm flock owners can be assured of higher health ratios combined with greater efficiency and economy of production possibilities. Quite a few of the State Agricultural Colleges, through their animal husbandry extension service, are following the plan of covering

their territories with ram trucks.

Benton's report of last season's ram truck service at the Michigan State College well illustrates the importance and value of this work. This project is sponsored and operated through co-operation of the Michigan Pure Bred Sheep Breeders' Association which provided the rams and maintained ownership and responsibility until they were sold; the Michigan Livestock Exchange, a co-operative livestock marketing commission firm, at Detroit; and the Michigan Agricultural College. The purebred rams offered for sale were selected at a State-wide ram show held on September 23 at the College. The rams were graded by a judging committee and designated by marking as to their suitability for different kinds of flocks. Prices of the rams averaged $35, running up to $50 for tops. Undesirable rams were not accepted; 181 rams were retained and 174 were sold. By breeds they were respectively, 83 Shropshires, 55 Oxfords, 28 Hampshires, four Black Tops, two Cheviots, one Cotswold, and one Rambouillet.

A scrub ram, one of its lambs and the mother were carried on the truck, also another group consisting of a registered Shropshire ram, one of his lambs and its mother. The lamb from the registered ram weighed sixty-five pounds, carried good type and conformation, while the one sired by the mongrel ram weighed fifty-eight pounds, and was inferior in all respects. They were the same age and had been handled similarly. Such visual evidence was not only educational, but resulted in placing several good rams which otherwise might not have been purchased.

If sold as a feeder on Michigan markets the good lamb would have brought nine cents per pound, while the inferior lamb would have sold for seven cents. The difference in sale value of these two lambs would then have been $1.79. If computed on the basis of fifty lambs the difference would have amounted to $89.50. This represents only the initial and smallest part of the return; subsequent gains by these two types of feeder lambs would have paid for the purchase of the registered ram many times over. In addition to immediate gains the replacement value of the best ewe lambs retained for breeding purposes would not only have been reflected in heavier yields of better grading wool, but also hardier breeding ewes with greater longevity, and efficiency and economy of production.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Electricity in the Home and on the Farm, by Forrest B. Wright ($2.75). Published by John Wiley and Sons, Inc.
(See Farmers Digest, November, 1941)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Management—By Robert R. Hudelson. The Macmillan Co. $1.80.
(See Farmers Digest, February, 1942)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Forestry in Farm Management—By R. H. Westveld, and Ralph H. Peck, John Wiley and Sons, Inc. $3.00.
(See Farmers Digest, September 1941)

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Review. $2.50.
(See Farmers Digest, October, 1941)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $4.00.
(See Farmers Digest, November, 1941)

Plant Ecology—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

The Nutgrowers Handbook—By Carroll D. Bush (Orange Judd Publishing Co.). $1.75.
(See Farmers Digest, January, 1942)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

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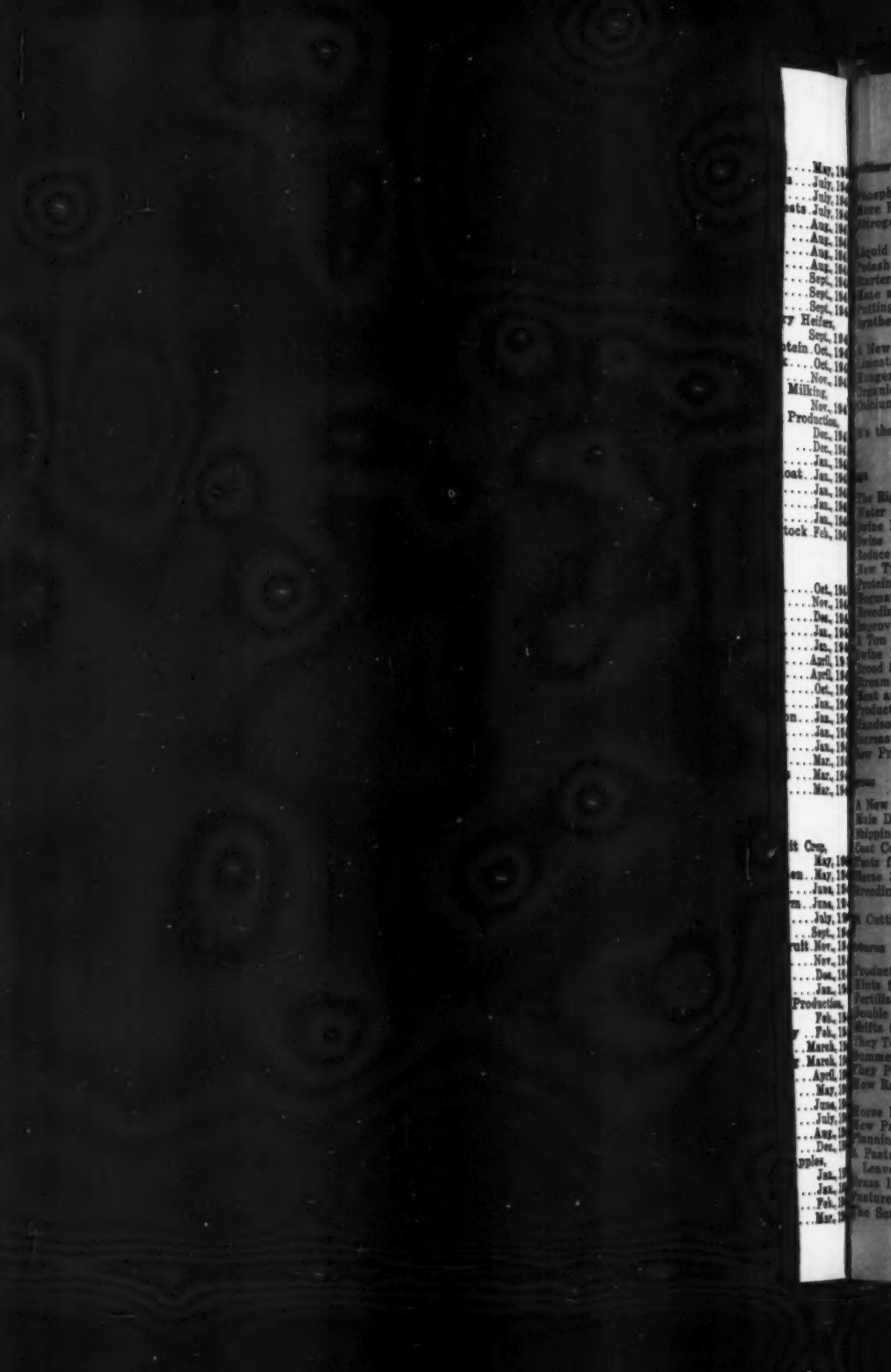

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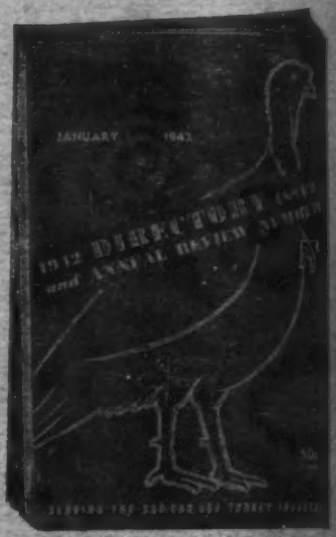
Presents Each Month Facts about Some Outstanding Agricultural Magazine

Turkey World is the specialized magazine serving the $80,000,000 turkey industry of the United States. It is planned specifically to provide information and to assist in solving the problems of those who depend on turkeys as a major source of income.



Each issue contains material on seasonal problems thus providing turkey people with the latest and best information when they need it most. The January issue each year is in the form of a Directory and Annual Review. There is nothing else in existence to compare with this. It is the only complete directory of manufacturers and distributors of all types of turkey feeds, supplies and equipment. In addition, it is packed with condensed outlines, tables, charts, graphs and picture presentations giving complete and usable information in well organized form.

Turkey World is a sister publication of Poultry Tribune and Hatchery Tribune. Each is recognized as the outstanding leader in its field. The editorial staff consists of a corps of well trained poultry specialists. O. A. Hanke, nationally recognized as an authority on poultry problems and a leader in the poultry industry, a graduate from University of Wisconsin, is editor-in-chief of these three publications. M. C. Small, who is an authority and leader in the specialized turkey field, a graduate in poultry husbandry from Purdue University, is managing editor of Turkey World.

The publication office is located in Mount Morris, Ill. Subscription price is $1 per year or three years for $2.

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